DOCUMENT RESUME

ED 481 256 CS 512 486

TITLE	Proceedings of the Annual Meeting of the Association for Education in Journalism and Mass Communication (86th, Kansas City, Missouri, July 30-August 2, 2003). Science Communication Interest Group.
PUB DATE	2003-07-00
NOTE	187p.; For other sections of these proceedings, see CS 512 480-498.
PUB TYPE	Collected Works - Proceedings (021) -- Reports - Research (143)
EDRS PRICE	EDRS Price MF01/PC08 Plus Postage.
DESCRIPTORS	Conservation (Environment); Females; Forestry; *Health Behavior; Higher Education; Information Management; *Journalism Education; Mass Media Use; *Media Coverage; Newspapers; *Scientific and Technical Information
IDENTIFIERS	Appalachia; Food Safety; Latinas; Mammography; Natural Resources Management; New York Times; *Risk Assessment; Stem Cells

ABSTRACT

The Science Communication Interest Group of the proceedings contains the following 7 papers: "Risk Perceptions and Food Safety: A Test of the Psychometric Paradigm" (Joye C. Gordon); "An Entertainment-Education Video as a Tool to Influence Mammography Compliance Behavior in Latinas" (Gail D. Love); "Promise or Peril: How Newspapers Frame Stem Cell Research" (Kimberly R. Taylor); "Communicating Forest Management Science and Practices through Visualized and Animated Media Approaches to Community Presentations: An Exploration and Assessment" (Donald E. Zimmerman, Carol Akerelrea, Jane Kapler Smith, and Garrett O'Keefe); "Women Searching the World Wide Web for Health Information: Exploring Thoughts and Information Management" (Maria E. Len-Rios and Frances Gorman); "Environmental Hazards, Cancer Risk Judgments, and Media Use in Appalachia" (Daniel Riffe); and "'New York Times' and National Magazine Coverage of Project Chariot, 1958 to 1962" (Ron Rodgers). (RS)

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Risk Perceptions and Food Safety: A Test of the Psychometric Paradigm

Joye C. Gordon, Ph.D.

Assistant Professor

A.Q. Miller School of Journalism and Mass Communication

Kansas State University

105 Kedzie

Manhattan, KS 66506-1501

Phone: 785-532-3954

Fax: 785-532-5484

email: gordon@ksu.edu

A paper presented at the 2003 conference of the Association for Education in Journalism and Mass Communication, Kansas City, MO

Running head: RISK PERCEPTIONS AND FOOD SAFETY

Risk Perceptions and Food Safety: A Test of the Psychometric Paradigm

Abstract

This study reports the findings of a national telephone survey to illuminate how Americans rank ten food-related hazards. Findings indicate that the psychometric paradigm is partially able to predict risk perceptions within the domain of food-related hazards. Findings show that foods which may have come from animals infected with BSE were considered the most risky hazard and that foods from genetically altered plants were considered the least risky hazard among respondents.

A paper presented at the 2003 conference of the Association for Education in Journalism and Mass Communication, Kansas City, MO

Risk Perceptions and Food Safety: A Test of the Psychometric Paradigm

Food products are inherently associated with multiple hazards including foodborne pathogens, pesticides, additives, and environmental contaminants, as well as nutritional hazards. Understanding the level of concern induced by food hazards is important because risk perceptions impact a host of food-related outcomes including purchasing and consumption preferences, food-handling behaviors, and the likelihood that citizens demand governmental regulation. Incidences in recent U.S. history, including Alar in apples, E. coli in Jack-in-the-Box hamburgers, Starlink corn, and Mad Cow Disease, highlight how food-related hazards impact society. This paper reports the findings of a national telephone survey questioning how Americans rank ten common food-related hazards and addresses the utility of the psychometric paradigm to predict responses to hazards within the food domain.

Several general concerns have contributed to the study of risk perceptions in recent decades including concerns about motivating people to action as well as concerns arising when conflicts erupt over hazards. Two generalizations can be drawn from this body of research. Firstly, risk perception is a factor associated with many behaviors. Secondly, the lay public's risk perceptions are often very different from the expert's.

Perhaps the most widely known approach to understanding why and how people form risk perceptions is the psychometric paradigm which proposes that characteristics of the hazard itself predicts responses (Slovic, 1987, 1992, 2000). The psychometric paradigm has been developed through studies examining hazards across domains and

using factor analysis to identify attributes associated with high levels of risk perception. Slovic (2000) highlighted attributes associated with high risk perceptions. Those attributes include:

- uncontrollable
- dread
- globally catastrophic
- consequences fatal
- high risk to future generation
- not easily reduced
- risk increasing
- involuntary
- not observable
- unknown to those exposed
- effect delayed
- new risk
- risk unknown to science

The psychometric approach helps explain why lay publics fear nuclear power much more than they fear household cleaners, even though the latter is responsible for more deaths. Nuclear power, for example, is a new risk that may be globally catastrophic. Cleaners, on the other hand, are familiar; have limited, immediate impacts; are observable; and are controllable.

But can the psychometric approach be applied to food hazards? Fife-Shaw and Rowe (1996) argued that models applicable to large-scale hazards may not apply to food, writing that risk reactions to food are unique for three reasons. Firstly, while we may choose which foods to eat, we have no choice to forgo food as we have a choice to reject, for example, a nuclear power plant. Secondly, food choices are driven by factors from the past including habit, tradition, and cultural norms and, as such, researchers can not know if behaviors influence perceptions or if perceptions influence behaviors. Thirdly, food

offers immediate and desirable benefits such as pleasure and physical comfort. For these reasons, it is not known how useful the psychometric approach is for explaining the discrepancy between lay people and experts within the food hazard domain.

The psychometric approach is also challenged by a developing cultural theory approach to understanding risk perceptions (Wildavsky & Dake, 1990). This approach focuses on an individual's orientation (hierarchist, individualist, egalitarian, or fatalist) as a predictor of which hazards one finds least acceptable. The cultural theory removes emphasis from attributes of the hazard itself and places emphasis not only on the attributes of those perceiving the hazard but also on the value systems employed in that process.

The current study asked respondents to rank ten food-related hazards. According to the psychometric paradigm, we would expect food-related hazards lacking the risk-inducing attributes to fall at the lower end (least risky) of the ranking and the hazards reflecting risk-inducing attributes to cluster at the top end (most risky) of the ranking. Foods containing cholesterol, sugar, and fat would be expected to fall at the lower end of a risk ranking because these hazards are controllable, not globally catastrophic, not immediately fatal, easily reduced, knowable, and voluntary. However, the hazards associated with food containing growth hormones, genetically altered plants and animals, and Mad Cow Disease would be expected to land at the top of the ranking because they are not controllable, not voluntary, not observable, and represent a new risks.

This study is useful not only to describe risk perceptions of Americans concerning prominent food-related hazards, but also to provide an opportunity to question the psychometric paradigm applicability to hazards within a single domain. While much

research has been conducted to measure risk responses to food hazards (Fife-Shaw & Rowe, 1996; Sparks & Shepard, 1994b; Frewer, Howard, Hedderley & Shepard, 1998), very little work specifically tries to explain how and why lay people make those determinations relating to foods (Sparks & Shepard, 1994a).

Method

A telephone questionnaire was constructed to assess rankings of ten food-related hazards. Hazards were selected to represent prominent issues in food safety, and final selection for inclusion was made by a panel of experts.

Using a random sample of residential phone numbers representing the contiguous 48 states, potential participants were contacted by phone and offered a five dollar incentive for participation. Participants were 18 years or older and the primary preparer of food in their home. Those having expertise in the area of food safety were disqualified. One trained interviewer conducted all interviews during the spring semester of 2002.

An incomplete block design was employed so that each respondent was exposed to three hazards, thus avoiding the fatigue and mental effort associated with ranking multiple items. The incomplete block design ensured that every hazard appeared the same number of times (36 times), and in relation to every other hazard the same number of times, across participants. Each participant was presented with three hazards and then responded to the question: "Which of the three is most risky to you and which is least risky to you?"

Data were analyzed using SPSS 11.0 for Windows. Descriptions of the participants were determined. Means and standard deviations were generated for each of the ten hazards.

Results

Ninety-one females and 29 males responded to the survey (n=120). The response rate was a dreadful 8.9 percent. The average age of respondents was 49 years, and 40.8% of respondents prepared meals 10 or more times each week.

Table one presents the means and standard deviations associated with each of the ten hazards. The range of means for each hazard was limited to between one and three because "most risky" hazards were assigned a one and "least risky" hazards were assigned a three.

Discussion

This study provides insights into the risk perceptions of Americans concerning ten food-related hazards. While the Centers for Disease Control and Prevention (2003) maintains that it is "extremely unlikely that BSE would be a foodborne hazard in this country," the public perceives BSE as *the* "most risky" hazard to themselves. Consistent with other studies, findings here reflect the theme that lay publics and the experts differ widely regarding risk perceptions.

Foodborne illness ranked second of the ten hazards offering opportunities for multiple interpretations. While food safety educators often argue that the public just doesn't think foodborne illness is a serious threat, media coverage on the topic is quite strong. Respondents were not provided a distinction between foodborne illness originating outside their own kitchens and foodborne illness originating in their homes. Such a distinction would likely impact findings.

A large body of research addresses public responses to genetically modified food products. Consistent with earlier findings, this study indicates that Americans rank

Table 1

Rankings of Ten Food-related Hazards

	Mean
Foods from animals that might have BSE also called Mad Cow Disease	1.36 (.59)
Foods containing organisms that cause foodborne illness or food poisoning	1.44 (.69)
Foods containing pesticide residues	1.67 (.72)
Foods containing growth hormone residue	1.83 (.74)
Food containing fat	1.92 (.84)
Foods from genetically modified animals	2.03 (.70)
Foods containing cholesterol	2.19 (.82)
Foods containing allergens, meaning foods that may cause allergic reactions	2.42 (.73)
Foods containing sugars	2.56 (.69)
Foods from genetically modified plants	2.58 (.55)

Note. Standard deviations appear in parenthesis.

Note. Lower means identified as more risky.

genetically modified plants as less risky than genetically modified animals. Ironically, no foods from genetically modified animals are currently available in the U. S., while genetically modified plants are wide-spread, occurring unlabeled in most products containing corn or soybeans. The fact that genetically modified plants are less offensive than genetically modified animals supports the cultural theory's emphasis on the value-driven dimensions of risk perceptions.

According to the psychometric paradigm, we would expect food-related hazards lacking the risk-inducing attributes to fall at the lower end (least risky) of the ranking and the hazards reflecting risk-inducing attributes to cluster at the top end (most risky) of the ranking. The hazards of foods containing cholesterol, sugar, and fat were expected to fall at the lower end of a risk ranking. Foods containing fat, cholesterol , and sugars ranked 5, 7, and 9 respectively, partially supporting the prediction. The hazards associated with food containing growth hormones, genetically altered plants and animals, and Mad Cow Disease were expected to land at the top of the ranking according to the psychometric approach. Foods from animals that might have BSE ranked number one. Foods containing pesticides and growth hormone residues ranked third and fourth respectively. Foods from genetically altered animals ranked sixth, just below foods containing fat. The notable exception to this prediction is that respondents ranked genetically altered plants as the least risky of all ten hazards.

In sum, this study neither strongly supports nor indicates failure regarding the utility of the psychometric approach to understanding risk perceptions. One of three hazards expected to be low on the ranking ranked above the midpoint, and one of the hazards expected to rank relatively high was ranked as the least risky hazard of the ten

examined. While the psychometric approach provides a strong platform to decipher why experts and lay people often have divergent assessments of hazards, there is still a need to develop stronger approaches to predicting lay people's risk perceptions.

References

Centers for Disease Control and Prevention. *Bovine Spongiform Encephalopathy and Creutzfeldt-Jakob Disease*. Retrieved July 9, 2003 from http://www.cdc.gov/ncidod/diseases/cjd/cjd.htm.

Fife-Shaw, C., & Rowe, G. (1996). Public perceptions of everyday food hazards: A psychometric study. *Risk Analysis, 16*(4), 487-500.

Frewer, L. J., Howard, C., Hedderley, D., & Shepard, R. (1998). Methodological approaches to assessing risk perceptions associated with food-related hazards. *Risk Analysis, 18*(1), 95-102.

Slovic, P. (1987). Perceptions of Risk. *Science, 236*, 280-285.

Slovic, P. (1992) Perceptions of risk: Reflections of the psychometric paradigm In D. Golding & S. Krimsky (Eds.), *Social Theories of Risk*. New York: Praeger.

Slovic, P. (2000). *The perception of risk*. London: Sterling.

Sparks, P., & Shepard, R. (1994a). Public perceptions of food-related hazards: Individual and social dimensions. *Food Quality and Preference, 5*, 185-194.

Sparks, P., & Shepard, R. (1994b). Public perceptions of the potential hazards associated with food production and food consumption: An empirical study. *Risk Analysis, 14*(5), 799-806.

Wildavsky, A. & Dake, K. (1990). Theories of risk perception: Who fears what and why? *Daedalus* 112: 41-60

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AN ENTERTAINMENT-EDUCATION VIDEO AS A TOOL TO INFLUENCE MAMMOGRAPHY COMPLIANCE BEHAVIOR IN LATINAS

By

Gail D. Love, Ph.D.
Assistant Professor
Department of Communications
California State University-Fullerton
P. O. Box 6846
Fullerton, CA 92834-6846
Email: glove@fullerton.edu
Phone: 714 278-3587

ABSTRACT

Purpose of the study is to gain a greater understanding of the relationship between culturally sensitive health-related messages and screening behavior among Latinas. A communication intervention in the form of a two-minute, Spanish-language, entertainment-education video was field tested in conjunction with a reinforcement interview one week after respondents viewed the video. Implications are increased knowledge and diffusion of information may not necessarily lead to short-term attitudinal and behavioral change, particularly when unpleasant consequences may result.

AN ENTERTAINMENT-EDUCATION VIDEO AS A TOOL TO INFLUENCE MAMMOGRAPHY COMPLIANCE BEHAVIOR IN LATINAS

INTRODUCTION

Widespread health communication campaigns for breast cancer screening in the U.S. have been effective in promoting screening behaviors by white, African American and higher socioeconomic (SES) women. In 2000, compliance with mammography guidelines for white women stood at 72.1 percent and at 67.9 percent for African American women, however for Latinas the rate is 61.4 percent, and for women below the poverty level it is a dismal 55.2 percent (CDC 2002). Cultural barriers are a factor for many minority women (CDC 2002), particularly those who are marginally

acculturated. This is tragically illustrated with Latinas, whose breast cancer incidence rate is lower than that for whites and African-Americans, but whose mortality rate is higher because their cancers are diagnosed so late (CDC 2002).

Health educators have a responsibility to reach women, particularly minority women and low-income women, with a breast education program that does not talk *at* them about early detection, but rather reaches out to them with a culturally appropriate message about a behavior that is perceived as both unfamiliar and unreasonable to them.

As we have seen countless times in health education programs conducted in Third World countries, teaching does not guarantee doing, and knowledge does not guarantee practice. It is imperative that we remember that knowledge of health information usually translates to action only for affluent, well-educated women who routinely practice early diagnostic and preventive behaviors. Most other women require a different approach.

For Latinas in particular bilingual is not necessarily bicultural. Simply translating English-language breast education programs is not going to guarantee compliance. Breast health is, first and always, a very personal matter. Open discussion about self-touching and self-observation of

certain parts of the body, such as the breasts, requires sensitive communication for women whose cultural heritage discourages such practices.

In addition to the cultural barriers, which discourage self-examination and mammography, many Latinas face a common barrier to early diagnostic or preventive behaviors, which questions why a person should spend money on medical procedures or go to the doctor when she is not sick or in pain. Additionally, Latinas' culture is very family-oriented, with women often cast as the central caregiver. Most Latinas take care of everyone else first, often neglecting their own welfare.

The emerging genre of the *entertainment-education strategy* holds a great deal of promise as a powerful vehicle to influence beliefs and attitudes of audiences. *Entertainment-education* is "the process of purposely designing and implementing a media message to both entertain and educate, in order to increase audience members' knowledge about an educational issue, create favorable attitudes, shift social norms, and change overt behavior" (Singhal & Rogers, 2002; Singhal & Rogers 1999).

In the past three decades, a number of efforts in both Third World countries and some Western industrialized countries have combined the entertainment format with

educational messages to produce innovative new mass media messages (Singhal et al, 2002, Singhal et al, 1990). Radio and television soap operas in particular have been used to communicate a wide variety of educational messages, from family planning to sexual abstinence by teens to AIDS prevention.

Intuitively, it makes sense to utilize the entertainment genre as a vehicle for educational messages. For decades, mass society has looked to entertainment media for guidance on what to wear, what to say, and what to think. In most countries, society looks to the stars of film, television and popular music for cues about fashion, appearance and behavior. Thus we receive power educational messages via entertainment media, even though the educational aspects may be unnoticed and unintentional (Rogers et al, 1989).

The strategy of entertainment-education is straightforward: Show people how they can be happier, healthier and safer through the universal appeal of entertainment (Rogers et al, 1989).

The notion of modeling behavior, wherein viewers model their own behavior after that of characters seen in television programming has roots in social learning theory (Bandura, 1977). Bandura suggests that humans learn social

behaviors through modeling their own behavior after the behavior of people they see in the mass media or with whom they interact personally. Entertainment-education soap operas generally provide both positive and negative role models for the health behavior being promoted. Positive role models are generally attractive to the audience and should be rewarded for their behavior, while negative role models are punished for negative behavior, and sometimes undergo a transition.

Miguel Sabido's entertainment-education soap operas in Mexico, which serve as the basis for most entertainment-education projects in developing countries, were solidly rooted in a theoretical base (Nariman, 1993). Sabido developed his entertainment-education soap opera formula around five theories: Shannon and Weaver's mathematical theory of communication (1948); the dramatic theory of Eric Bentley (1967); universal energies theory as developed by Jung; Bandura's (1977) social learning theory; and MacLean's (1973) concept of the triune brain. Social learning theory is at the heart of Sabido's strategy, as he developed soap opera characters who served as positive and negative role models for the educational theme, and who received rewards or punishments as they practiced or rejected socially desirable behaviors.

Singhal and Rogers (2002) contend it is time for researchers to "pay greater attention to the various types of entertainment-education interventions, including differences in their scope, size, reach, intensity, and other attributes."

Because the present study limits exposure of the Latina audience to a single viewing of the communication intervention, a modification to the standard entertainment-education soap opera format is necessary.

One of the shortcomings of the soap opera genre as a one-time communication intervention is its inherent dependence on repetitive exposure. In outlining 20 guidelines for further development of entertainment-education soap operas for communicating behavior for social change, Nariman suggested that the entertainment-education strategy is most effective "when applied in a repetitious form of entertainment" (Nariman, 1993, p. 181).

While the present study is the first known attempt to use the entertainment-education soap opera format in a one-time, non-mass media exposure, Johns Hopkins University's Center for Communication Programs used a non-mass media format, dramatic street theater, which reached only a few hundred people per performance in India and in Bolivia to communicate HIV/AIDS information and to promote family

planning respectively. The street theater experience is that the one-shot exposure produces effects if a counselor or educator steps forward immediately after the play ends to discuss the play's message with the audience, and answer questions (Valente & Bharath, 1999; Valente et al, 1995).

Purpose and Design of the Study

Culturally sensitive communication can play a role in influencing health-related behavior among minority populations (Rogers, 1991). The focus of the present research is to better understand the relationship between culturally sensitive communication messages and mammography screening behavior among Latinas.

Specifically, a communication intervention to increase knowledge, change attitudes, increase interpersonal discussion, and increase mammography compliance among Latinas was developed and field tested. The intervention is a unique, two-minute Spanish-language video entitled *Hermanas* (Sisters), which looks like a segment from a television soap opera. The video combines the concepts of (1) a "trigger" video, specifically designed to "trigger" discussion of the topic; and (2) an entertainment-education strategy, patterned after the successful entertainment-education television soap operas aired in

Mexico in the late 1970s and 1980s. These works, which were produced by Miguel Sabido, were solidly rooted in a theoretical base centered on social learning theory, and provide the basis for most subsequent entertainment-education projects in other developing countries (Singhal and Rogers, 1999).

Hermanas depicts two Latina sisters relaxing over coffee at the end of the day. The older sister (Sandra) reluctantly confesses that she failed to keep her mammography appointment earlier that day. Chastised by her younger sister (Marci), Sandra poignantly offers the excuses most cited by Latinas for failing to get a mammogram. When Marci counters the excuses, Sandra cites barriers most often identified by Latinas for non-compliance. Marci's emotional responses offer viewers information on the importance of mammography screening, while Sandra represents a sympathetic figure fortunate enough to have someone who loves her to prod her into a behavior she does not want to perform. The video closes with Sandra promising to get her mammogram soon, and a slow pan to an attractive young Latina health educator who reminds viewers that a mammogram can detect breast cancer when it is barely larger than a grain of sand. She reminds the audience that they should get a mammogram for

themselves and for those they love, once a year for a lifetime.

The entertainment-education video intervention was field tested by embedding it within a one-hour, Spanish-language breast health program provided by a trained, bilingual, Latina educator to Latinas at their work sites and in the ambulatory clinic waiting room of a large university-affiliated hospital, which offered low-cost or no-cost mammograms on site. A three-group experimental design with a pre-test, post-test and one-week follow-up test, operationalized measures of the video's effectiveness: (1) increased knowledge of breast cancer; (2) increased knowledge of mammography; (3) a more positive attitude toward breast cancer; (4) increased discussion about breast cancer with female friends and/or family members; and (5) increased mammography compliance, defined as obtaining a mammogram or reporting the intention to obtain a mammogram.

The effects of the entertainment-education video were studied in conjunction with a related intervention (an experimental treatment): A follow-up reinforcement interview conducted with Latina respondents one week after the educational program by the bilingual health educator who conducted the educational program.

Theoretical Foundation and Literature Review

The present study draws upon three theoretical perspectives: The entertainment-education communication strategy; social learning theory; and Lewinian theory, each of which will be discussed below.

From the earliest tabloid-like penny newspapers through today's instantaneous worldwide dissemination of images via satellite and videophone, mass media content can generally be categorized as either *entertaining* or *educational*. *Entertainment* is "a performance or a spectacle which captures the interest or attention of an individual giving him/her pleasure, amusement, or some form of gratification." *Education* is "a formal or informal program of instruction and training which has the potential to develop an individual's skill to achieve a particular end by boosting his/her mental, moral or physical powers (Singhal, 1990).

The above categories and definitions of "entertainment" and "education" suggest links to uses and gratifications theory. Uses and gratification theory assumes that mass communication audience members initiate media selection, are goal-directed in their media use, and actively select differing media and content to fulfill

their felt needs (Katz et al., 1973; Rubin, 1986; Tan, 1985). Additionally, uses and gratifications have been researched for a variety of behaviors (e.g., McLeod et al, 1982), though none specifically related to cancer-related information seeking.

What is generally considered to be the first recognizable interventions using the entertainment-education concept occurred in several countries: the Australian Broadcasting Corporation's *The Lawsons* in 1944; the BBC radio series *The Archers* in 1951, and the Peruvian *telenovela* (television soap opera) *Simplemente Maria* in 1969. At that time the notion of education messages embedded in entertainment programs did not exist, and communication scholars were not a part of the design or evaluation of effects (Singhal et al 1994).

Following the broadcast of *Simplemente Maria* in Mexico, Miguel Sabido, who worked as a creative writer-producer-director at Televisa, the private Mexican television network, set about to understand the theoretical basis of the *telenovela* by deconstructing it. Sabido then produced a series of six entertainment-education television programs for Televisa, whose impacts were evaluated (Nariman, 1993; Singhal & Rogers, 1999).

Sabido drew heavily on Albert Bandura's (1977, 1997) social learning theory, which later evolved into social cognitive theory, in designing his entertainment-education *telenovelas*. Since that time theorizing and research about entertainment-education was dominated by this theoretical approach. Sabido's methodology for the design of entertainment-education, in particular soap operas, heavily influenced much of the later work in entertainment education.

This "natural fit" between Bandura's theory and the entertainment-education interventions which were to follow comes in the form of the interventions' use of positive and negative role models which seek to influence audience behavior (Singhal & Rogers 2002).

During the 1980s and 1990s, there were improvements in understanding the effects of entertainment-education interventions, particularly since the mid-1980s when university-based scholars became involved in research on entertainment-education. As entertainment-education has evolved, particular attention is being paid to the role of several key concepts: social modeling, self-efficacy, parasocial interaction, and media-stimulated peer communication in stimulating behavior change (Singhal & Rogers 1999).

In social modeling theory, Bandura proposed that individuals observe and imitate the behavior of other individuals, who serve as both positive and negative role models, resulting in learned behavior changes (Bandura 1977, 1997). Bandura has now become increasingly interested in applications of his theory to entertainment-education concepts, and has taken steps to sharpen the strategy, particularly in regard to the concept of self-efficacy, which is an individual's perception of his or her capability to deal effectively with a situation, and a sense of perceived control over a situation (Bandura, 1977, 1997; Rogers, 1995).

Further evidence of Bandura's interest in entertainment-education is evidenced by his contribution of a chapter on "Social Cognitive Theory for Personal and Social Change by Enabling Media" to Singhal et al (eds.) 2003.

Another important key in entertainment-education effects is the concept of parasocial interaction, that is, the development of a parasocial relationship with a fictional character. Horton and Wohl (1956) proposed the concept of parasocial interaction, and Rubin et al (1985) and other scholars (such as Rubin & McHugh, 1987) have measured parasocial interaction between audience members

and television role models. Using a scale composed of several items (such as, "Do you talk to your faviorite television character during the broadcast?") a high degree of parasocial interaction was found. It is suggested audience members of entertainment-education soap operas are influenced to change their behavior through this parasocial interaction.

Past research within the entertainment-education strategy suggests that certain of its effects is as a catalyst for triggering interpersonal peer communication leading to changes in the social discourse of the audience (Storey, 1995), and in motivating receivers to talk to each other about things they learned from the entertainment-education message (Rogers, 1995).

Group discussion between the health educator and the participants in the present study is a key component of the communication process. The role of the educator as facilitator or group discussion leader, as well as design of the study as a field experiment, was guided by Lewinian theory.

A social psychologist, Kurt Lewin is noted for founding research and training on group dynamics. Like the other "founding fathers" (Rogers, 1993) of communication science, Lewin did not perceive himself as studying

communication processes, although his work in group dynamics is considered seminal in the field.

Lewin's field experiments at the University of Iowa are classics in communication research. His "sweetbread studies," designed to increase consumption of so-called glandular meats during World War II, revealed startling differences between behaviors of members in lecture meetings versus those in discussion groups led by a researcher particularly skilled in group leadership. In a follow-up survey done several weeks after the meetings, only 3 percent of Iowa housewives in the lecture meetings actually served sweetbreads, whereas 32 percent of the discussion group members served sweetbreads (Lewin, 1958). It was suggested that the difference in the effects of the two experimental treatments was due to the higher level of involvement within the discussion condition, where housewives took an active part by asking questions and sharing experiences with the group. The sweetbread study became a classic in communications research in spite of its several shortcomings.

Generalizing results of the sweetbreads study and other researches conducted at Iowa, Lewin developed a three-step procedure for changing behavior which he referred to as (1) unfreezing; (2) moving, and (3)

freezing the new behavior. Because behavior which has been changed is frequently reverted back to by individuals, the influence of other groups members is extremely important in both changing and maintaining behaviors. Lewin (1943) observed: "The group decision had a 'freezing' effect for future action" (quoted by Rogers, 1993).

The design of the present study incorporates the essence of Lewin's group discussion condition. All three groups received the breast care education program in a warm, friendly atmosphere encouraging interaction and discussion. The leader was a Spanish-speaking woman, trained to make participants feel comfortable discussing a topic as gender-sensitive as breast health. Because all discussions were conducted in Spanish, and the questionnaires were in Spanish, Latina participants felt ownership of the educational program, displaying no intimidation or hesitation to ask questions, offer comments or share experiences. The leader asked participants in all groups for a public commitment through a show of hands to practice breast self-examination and to get their mammograms.

In designing the present study's two-minute video, the "trigger film" concept suggested by Slote (1993) was utilized. Slote suggested the usefulness of the short

"trigger" video (three to five minutes) as an attention-getting device only, not as the primary information vehicle. The trigger video was designed to generate audience attention and participation through an abbreviated but highly visual presentation, which acted as a prelude to a live instructor, who then elaborated and expanded on the information presented in the video. The trigger video structure fits well with Johns Hopkins' strategy of presenting a live instructor or educator immediately after the presentation to facilitate discussion and questions from the audience.

The limits presented by the presentation structure in the present study suggest construction of a video which incorporates concepts from three strategies: (1) production components and scripting structure from Sabido's soap operas; (2) editing and format from Slote's concept of a brief, highly visual "trigger" presentation; (3) epithet designed to facilitate immediate interaction between a credible educator and the audience, from Johns Hopkins' one-shot strategy.

Drawing upon these theoretical perspectives to guide development and field testing of communication, theoretical hypotheses were developed for the present study.

Theoretical and Empirical Hypotheses

The present study hypothesized increase in five measures of the effectiveness of the video and a one-week follow-up reinforcement interview by the health educator. The theoretical and empirical hypotheses are:

(1) Theoretical: Exposure to the entertainment-education video message increases knowledge about breast cancer.

Empirical: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in levels of breast cancer knowledge from T-1 to T-3 than will members of Group 1 (control).

(2) Theoretical: Exposure to the entertainment-education video message increases knowledge about mammography.

Empirical: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in levels of breast cancer knowledge from T-1 to T-3 than will members of Group 1 (control).

(3) Theoretical: Exposure to the entertainment-education video message increases positive attitudes about breast cancer.

Empirical: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in

positive attitudes toward breast cancer from T-1 to T-3 than will members of Group #1 (control).

(4) Theoretical: Exposure to the entertainment-education video message increases discussion of breast cancer with friends and family members.

Empirical: Members of Groups #2 (video only) and #3 (video plus follow-up) will discuss breast cancer with more friends and family members than will members of Group #1 (control).

(5) Theoretical: Exposure to the entertainment-education video message increases mammography compliance behavior.

Empirical 5a: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Groups #1 (control) and #2 (video only).

Empirical 5b: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Empirical 5c: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #2 (video only).

Empirical 5d: Members of Group #2 (video only) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Empirical 5e: Members of Group #2 (video only) and Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Figure 1 is a summary of the hypothesized effects of the entertainment-education video and the follow-up reinforcement interview.

Method

The entertainment-education intervention was evaluated via an experimental design involving 175 Latinas, age 35 to 71, randomly divided into three groups, who attended a one-hour breast health education program presented in Spanish by a bilingual Latina health educator (Figure 2). The groups included:

Group 1: A control group of 58 Latinas who received the educational program with no entertainment education video or reinforcement interview.

Group 2: A group of 57 Latinas who received the educational program with the entertainment-education video only.

Group 3: A group of 60 Latinas who received the educational program with the entertainment-education video plus a reinforcement interview via telephone one week after the educational program

Each respondent was asked to complete a pre-test questionnaire and a post-test questionnaire. Groups 1 and 2 were administered a follow-up questionnaire by telephone one week after the educational program. Group 3 received a reinforcement interview by telephone one week after the educational program, and were administered a follow-up questionnaire by telephone one week after the reinforcement interview. A total of 15 programs were presented at four different sites in two Southern California counties over a ten-day period.

A total of 374 respondents received the educational program. Of this number, 199 were eliminated for the following reasons: 131 were under age 35; 30 did not have a telephone number written on their questionnaire; 11 did not answer the telephone after three attempts to

complete a follow-up questionnaire; 27 submitted incomplete written questionnaires. Respondents under age 35 were eliminated from the present study because breast cancer screening guidelines do not recommend mammograms for women under 36.

Data Analysis

All measures were calculated for the three groups (#1: control, #2: video only, and #3 video plus follow-up interview) at three points in time. Statistical significance of the differences in mean change scores for the three groups, across the three points in time, were calculated by t-tests, using an alpha of 5 percent. Each of the empirical hypotheses were to be accepted or not accepted on the basis of statistical significance.

Findings

Because the video intervention and the reinforcement interview intervention in the present study were embedded within a one-hour educational program, effects were anticipated in all three groups, including the control group (Group #1), which received neither of the two interventions of study. Pre-post change values were calculated. The overall change, that is the change from T-1 to T-3, was used as the variable for testing the hypotheses. A t-test was calculated to determine the

statistical significance of the differences in mean change scores using an alpha of 5 percent. Empirical hypotheses were supported or not supported on the basis of statistical significance.

Empirical Hypothesis 1: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in levels of breast cancer knowledge from T-1 to T-3 than will members of Group 1 (control).

Results revealed that the mean change scores for breast cancer knowledge from T-1 to T-3 for Groups #2 and #3 ($\underline{M}$ = .45) were greater at a statistically significant level than the mean change scores for breast cancer knowledge for Group #1 ($\underline{M}$ = .21) (Table 1). The $\underline{t}$ value of 2.01 is greater than the one-tailed tabular value of $\underline{t}$ of 1.6, with 173 degrees of freedom. Empirical Hypothesis 1 was supported.

Empirical Hypothesis 2: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in levels of breast cancer knowledge from T-1 to T-3 than will members of Group 1 (control).

Results revealed that the mean change scores for mammography knowledge from T-1 to T-3 for Groups #2 and #3 ($\underline{M}$ = .50) were greater at a statistically significant level than the mean change score for breast cancer knowledge for

Group #1 (M = .16) (Table 2). The t value of 2.96 is greater than the one-tailed tabular value of t of 1.658, with 173 degrees of freedom. Empirical Hypothesis 2 was supported.

Empirical Hypothesis 3: Members of Groups #2 (video only) and #3 (video plus follow-up) will have a greater increase in positive attitudes toward breast cancer from T-1 to T-3 than will members of Group #1 (control).

Results revealed that the mean change scores for positive attitudes toward breast cancer from T-1 to T-3 for Groups #2 (video only) and #3 (video plus follow-up) (M = .17) were not greater at a statistically significant level than the mean change score for positive attitudes toward breast cancer for Group #1 (M = .17) (Table 3). The t value of .68 is less than the one-tailed tabular value of t pf 1.658 with 170 degrees of freedom. Empirical Hypothesis 3 was not supported.

Empirical Hypothesis 4: Members of Groups #2 (video only) and #3 (video plus follow-up) will discuss breast cancer with more friends and family members than will members of Group #1 (control).

Results revealed that the mean change scores for discussion with more friends and family members from T-1 to T-3 for Groups #2 (video only) and #3 (video plus follow-

up) ($\underline{M}$ = .04) were greater at a statistically significant level than the mean change score for discussions with more friends and family members for Group #1 ($\underline{M}$ = .09) (Table 4). The $\underline{t}$ value of 2.39 is greater than the one-tailed tabular value of $\underline{t}$ of 1.658, with 173 degrees of freedom. Empirical Hypothesis 4 was supported.

Empirical Hypothesis 5a: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Groups #1 (control) and #2 (video only).

Results revealed that the mean change score for mammography compliance from T-1 to T-3 for Group #3 (video plus follow-up) ($\underline{M}$ = .52) was not greater at a statistically significant level than the mean change scores for mammography compliance for Groups #1 and #2 ($\underline{M}$ = .44) (Table 5). The $\underline{t}$ value of .45 is less than the one-tailed tabular value of $\underline{t}$ of 1.658, with 167 degrees of freedom. Empirical Hypothesis 5a is not supported.

Empirical Hypothesis 5b: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Results revealed that the mean change score for mammography compliance from T-1 to T-3 for Group #3 (video

plus follow-up) (M = .52) was not greater at a statistically significant level than the mean change score for mammography compliance for Group #1 (M - .31) (Table 6). The t value of .96 is less than the tabular value of t of 1.658, with 110 degrees of freedom. Empirical Hypothesis 5b is not supported.

Empirical Hypothesis 5c: Members of Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #2 (video only).

Results revealed that the mean change score for mammography compliance from T-1 to T-3 for Group #3 (video plus follow-up) (M = .52) was not greater at a statistically significant level than the mean change score for mammography compliance for Group #2 (M =.56) (Table 7). The t value of .21 is less than the tabular value of t of 1.658 with 110 degrees of freedom. Empirical hypothesis 5c is not supported.

Empirical Hypothesis 5d: Members of Group #2 (video only) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Results revealed that the mean change score for mammography compliance from T-1 to T-3 for Group #2 (video

only) ($\underline{M}$ = .56) was not greater at a statistically significant level than the mean change score for mammography compliance for Group #1 ($\underline{M}$ = .31) (Table 8). The $\underline{t}$ value of 1.29 is less than the single-tailed tabular value of $\underline{t}$ of 1.658 with 109 degrees of freedom. Empirical hypothesis 5d is not supported.

Empirical Hypothesis 5e: Members of Group #2 (video only) and Group #3 (video plus follow-up) will have a greater increase in mammography compliance from T-1 to T-3 than will members of Group #1 (control).

Results revealed that the mean change scores for mammography compliance from T-1 to T-3 for Groups #2 (video only) and #3 (video plus follow-up) ($\underline{M}$ = .54) was not greater at a statistically significant level than the mean change score for mammography compliance for Group #1 ($\underline{M}$ = .31) (Table 9). The $\underline{t}$ value of 1.28 is less than the single-tailed, tabular value of $\underline{t}$ of 1.658, with 165 degrees of freedom. Empirical hypothesis 5e is not supported.

Figure 3 is a summary of the findings for hypothesized effects of the entertainment-education video and the follow-up reinforcement interview.

Conclusions

Data analysis revealed that while the entertainment-education video and follow-up reinforcement interview produced significant effects in knowledge of both breast cancer and mammography, they were not as effective in producing significant positive attitudes about breast cancer and mammography compliance.

Several implications are suggested by these findings. First, the experimental treatments increased knowledge, however knowledge may not necessarily lead to attitude change or behavior change, at least not immediately. Rogers (1991) suggests preventive behaviors are difficult to diffuse because rewards are distant in time and not assured. The same principle may apply to early detection behavior, that is, successful diffusion of breast cancer and mammography information may not be sufficient to produce attitudinal and behavioral change, particularly when the behavior may result in one or all of several consequences, all of which are unpleasant:

(1) She may find that she has a dreaded disease

(2) She may find that the behavior is painful

(3) She may find that the behavior is embarrassing

(4) She may find that the behavior is inconvenient

(5) She may find that the behavior is costly

Evaluation research on attempts to diffuse family planning and preventive health behaviors in many Third World countries reveal a similar situation, that is, knowing what to do does not necessarily translate to doing it (Rogers 1973).

Findings regarding increased knowledge and behavioral change in the present study are consistent with typical findings in evaluation research for entertainment-education programs. In general, sharp increases in knowledge levels are achieved, however change in behavior does not necessarily follow, particularly in the short term (Rogers 1991).

The inverse relationship between knowledge and behavior change in both the present study and past entertainment-education studies suggests reinforcement of the notion that cultural norms are stronger influences on behavior than knowledge among minority members of society. This notion has strong implications for content and focus of culturally sensitive communication.

A more effective entertainment-education video might portray characters as positive role models who receive

rewards for their positive attitudes and behavior, as suggested by social modeling behavior. That is, the *Hermanos* character who was afraid to get her mammogram should instead by portrayed as a positive role model who finally conquered her fear, got her mammogram, and found that it was (1) merely uncomfortable, not painful; (2) not that inconvenient since her sister, her mother and her friends provided support; (3) not that costly, as she found a low-cost mammogram available; (4) that the peace of mind she felt was very rewarding; and (5) that she now realizes that what she should fear more is not knowing whether or now she has breast cancer.

The significant increase in discussions about breast cancer with friends and family members also suggests a possible first step toward diffusing early detection behavior. A negative attitude toward breast cancer could lead to negative behavior regarding its detection. In carrying the positive role model notion a step further, perhaps the *Hermanos* character should reveal that she finally gained the courage to get her mammogram because she discussed it with her best friend or her sister or her daughter, and that she is now going to discuss her positive

experience with another of her friends or perhaps her sister-in-law.

There were a number of limitations in the present study. The first involved the size and homogeneity of the intact groups. Because specific treatments were randomly assigned at each site to include the video (respondents in Group 2), or not to include the video (respondents in Group 1), or to include the video and a follow-up reinforcement interview (respondents in Group 3), the author could not control which type of educational program would be offered at which time of day; that is, even if the author knew the early-morning program would attract a much larger number of respondents, or a much older group of respondents, she could not divide the group or change the type of educational program to balance out the number or respondents in the three groups. Programs at two of the sites were advertising via flyers, and attendance was voluntary. While flyers asked women to telephone for reservations, only two reservations were received for one education program, and no reservations were received for the other. While attendance was mandatory for respondents at the site involving employees of a school district, the women could choose which of the three educational programs

offered they wished to attend. An inordinately large number of these women were in the control group because the program with no intervention was randomly selected for the early morning session, and most women wanted to attend early-morning programs so they could go home as soon as possible.

This intact group, whose members tended to be more affluent and better-educated, made up the bulk of the control group not only because of their large numbers, but also because few were eliminated due to age (most were over 35) or on the basis of not having a telephone (all had telephones) or because of difficulty in reaching them for the T-3 follow-up reinforcement interview (the majority were available at the telephone number and at the time indicated on their questionnaire). While an equally large number attended the next class, just after lunch, that group was not skewed because many of the mid-day program respondents were eliminated because they were under 35.

The homogeneity of intact groups tended to exclude large numbers of respondents also. For example, a good many respondents at two of the sites tended to be younger, therefore they were eliminated because they were under 35. Few were eliminated from the school district group because

of age, since most were over 35. Also, many respondents at the county hospital site were eliminated because of low literacy levels. A number could not read the questionnaire, and others took so long to complete the pre-test questionnaire that they simply stopped working on it once the educational program began. Many of the county hospital participants were also eliminated because they had no telephone, or because they were no longer available at the telephone number they wrote on the questionnaire at the time of the T-3 follow-up, or because they were suspicious and afraid to talk to the educator when she called for the T-3 reinforcement interview.

One of the most significant limitations of the present study was the homogeneity of all groups, particularly the control group. The intact group for the morning educations program at the school district dominated the control group because of its large number. Additionally, because most members of the control group came from the same sight, and tended to be well-informed compliers with a positive attitude about breast cancer, their scores at T-1 were higher than scores for one of the other groups at T-3. The high scores on all measures for the control group at T-1 resulted in a ceiling effect, wherein little variance

within the group was possible since so many members scored so high at T-1. This intact group phenomena could have been addressed if logistics has permitted presentation of three programs simultaneously at each site, allowing respondents to be randomly assigned as individuals, not as groups.

Another limitation to be addressed as a contributor to the lack of significance in behavioral change is the fact that the entertainment-education video in the present study was a "one-shot" application of the entertainment-education strategy. In nearly all programs utilizing an entertainment-education strategy, interventions were repetitive, broadcast daily and/or weekly. The repetition of the format was a strong reinforcement to influencing behavior (Rogers 1991).

Secondly, the present study was limited by the necessity to word questionnaire items in the simplest possible way in order to accommodate respondents with relatively low literacy levels. The questions measuring knowledge were so basic that more-educated women scored extremely high on the pre-test, leaving little room for variance over time. By contrast, the county hospital

respondents struggled with their responses, and some actually showed a decrease in knowledge.

Shortcomings of the present study include the tendency of many respondents, particularly minority respondents, to report the answers they perceived that the educator wanted. This response-set program was compounded when the post-test questionnaire was completed, as many of the women became quite fond of the health educator during the friendly, interactive discussion. Additionally, many respondents exhibited anxiety and embarrassment in completing the questionnaire, viewing it as a "test" of sorts, for which they might now know the right answers.

Future Research

The present study reveals several areas for future research. More research is needed on the use of the entertainment-education strategy in "one-shot" applications such as that used in the present study. Researchers have little experience in using this strategy in settings other than via the mass media. Findings in the present study suggest the strategy applied in a "one-shot" setting can be effective in increasing knowledge among minority women. The next step is to explore different scenarios directed to specific audiences. Additionally, research is needed to

determine whether use of recognizable soap opera stars in an entertainment-education video would influence behavior, specifically in casting a well-known, popular star as a positive role model who gets her mammogram regularly.

Additionally, innovative new ways should be explored to combine mediated entertainment-education interventions and interpersonal communication of culturally sensitive messages. Past efforts to communicate bilingual rather than bicultural messages via mass media have proven to be ineffective. Findings from the present study suggest more emphasis on the key role played by a bilingual educator who is perceived as a warm, friendly person who understands and cares, not an authoritative, impersonal expert who simply communicates behaviors that should be performed.

More research is needed in understanding the power of media-stimulated peer communication. The breast cancer educator/facilitator should encourage interpersonal discussion both within and outside the group, particularly in relation to the intervention. It is suggested that the title of the intervention, *Hermanas* (sisters), is an excellent way to encourage audience members to think about and to discuss mammography compliance with female family members and friends. We are all sisters and we need to care

about each other and help each other to do all we can to protect ourselves from breast cancer.

More research is needed to determine appropriate communication messages for specific audiences, i.e., higher SES level women versus lower SES level women. Specifically, should higher SES women, particularly those who are compliers (women who get mammograms regularly) receive communication messages urging them to disseminate the information they possess to other women?

The notion of diffusing communication messages through friends and family members should be explored. Relationship between compliers and the women with whom they discuss breast cancer should be explored, keying on the direction of the communication flow. For instance, do older compliers tend to discuss breast cancer with their daughters, and thus influence their decision to comply? Do younger compliers tend to discuss breast cancer with mothers, grandmothers, aunts or friends who are not compliers? Suggested research questions include whether the primary audiences for culturally sensitive communication messages for minority women should be opinion-leaders, or younger women. Compliance rates clearly demonstrate that younger women tend to be more

compliant, with compliance rates declining with age. Older women's compliance must be addressed, as breast cancer risk increases with age.

Researchers should also look to successful and unsuccessful preventive behavior information campaigns. While messages created to stop people from smoking may seem quite removed from messages created to motivate women to get a mammogram, there are certain overlaps. Specific attention should also be paid to extensive information programs for preventive behavior among Latinos.

By all indications, breast cancer will remain a high-profile public issue for some time to come, which means the disease will remain a frequent topic of news stories in the mass media. Many of these news stories reinforce negative attitudes toward breast cancer, through emphases on topics such as celebrity women's diagnoses and new findings linking breast cancer incidence to a full range of risk factors. This continual reinforcement of negative information about breast cancer requires equally power communication messages to cultivate positive attitudes toward breast health and breast cancer and its early detection, particularly among lower SES and minority women.

The time we finally convince all women that the major factor to fear about breast cancer is *not* knowing you have

it, is the time when communication will contribute to saving thousands of women's lives.

Bibliography

Backer, T., Rogers, E., Sopory. P (1992) *Designing Health Communication Campaigns: What Works?* Newbury Park, CA: Sage.

Bandura, A. (1977), *Social Learning Theory,* Englewood Cliffs NJ: Prentice-Hall

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: Freeman

Bently, E. (1967), *The Life of Drama.* New York: Antheneum.

Centers for Disease Control (2002) National Center for Health Statistics

Centers for Disease Control (2002) Use of Mammography, *Health, United States*

Horton, D., & Wohl, R. R. (1956). Mass communication and parasocial interaction: Observation on intimacy at a distance. *Psychiatry,* 19(3), 215-229.

Katz, E., Gurevitch, M., and Haas, H. (1873), On the use of the mass media for important things. *American Sociological Review,* 38:164-181.

Lewin, K. (1947) Frontiers in group dynamics: I. Challenge of group life: social planning and action research *Human Relations.* 143-153

Lewin, K. (1958), Group decision and social change. In E. E. Maccoby, T. M. Newcomb and E. L. Hartley (eds.), *Readings in Social Psychology,* 3rd Ed., 197-211. New York: Holt, Rinehart and Winston.

MacLean, P. D. (1973), *A Tribute Concept of the Brain and Behavior.* Ontario Mental Health Foundation. Toronto, Canada: University of Toronto Press. P. 2-22.

Magnus, H. (Ed.) (1982) *Trends in Cancer Incidence.* Washington, D.C.:Hemisphere.

McLeod, J., Bybee, C., and Durall, J. (1982), Evaluating media performance by gratifications sought and received. *Journalism Quarterly*, 59:3-12.

Nariman, H. N., (1993), *Soap Operas for Social Change: toward a Methodology for Entertainment-Education Television*. Westport, Conn: Praeger.

Rogers, E. M. (1973), *Communication Strategies for Family Planning*. New York: Free Press.

Rogers, E. M. (1986), *Communication Technology*. New York: Free Press

Rogers, E.M., Aikar, S., Chang, P., & Sopory, P. (1989), Proceedings from the conference on entertainment-education for social change. Los Angeles, CA: University of Southern California, Annenberg School for Communication.

Rogers, E. M. (1991), Communication campaigns to change health-related lifestyles; Paper presented to the XIV World Conference on Health Education, Helsinki, Finland, June 16-21.

Rogers, E. M. (1993) *Organizational Factors in Health Campaigns*. Newbury Park, CA.: Sage.

Rogers, E.M. (1995) *Diffusion of innovations* (4th ed.). New York: Free Press.

Rubin, A. M. & Rubin, R.C. (1985) Interface of personal and mediated communication: A research agenda. *Critical Studies in Mass Communication*, 2, 36-53.

Rubin, A. (1986), Uses, gratification and media effects research. In J. Bryant and D. Zillmann (Eds.), *Perspectives on Media Effects*. Hillsdale, NJ: Lawrence Erlbaum.

Rubin, R.C., & McHugh, M. P. (1987) Development of parasocial interaction relationships. *Journal of Broadcasting & Electronic Media*, 31, 279-292.

Shannon, C. & Weaver, W. (1949), *The Mathematical Theory of Communication.* Urbana, University of Illinois Press.

Singhal, A. (1990) Entertainment-Education Communication Strategies for Development. Unpublished doctoral dissertation. Annenburg School of Communication University of Southern California, August.

Singhal, A., Obregon, R. & Rogers, E.M. (1994) Reconstructing the story of *Simplemente Maria,* the most popular telenovela in Latin America of all time. *Gazette,* 54, 1-15.

Singhal, A, Rogers, E.. (1999) *Entertainment-Education: A Communication Strategy for Social Change.* Mahwah, NJ: Lawrence Erlbaum Associates.

Singhal, A., Cody, M., Rogers, E., & Sabido, M. (2003), (Eds.), *Entertainment-education and Social Change: History, Research, and Practice.* Mahwah, NJ, Lawrence Erlbaum Associates.

Slote, A. (1993) Personal telephone interview by the author, April.

Storey, D. (1995, May) *Entertainment-education, popular culture, and the sustainability of health communications: Lessons from Indonesia and Pakistan.* Paper presented at the International Communication Association Conference, Albuquerque, NM.

Tan, A. (1985), *Mass Communication Theories and Research.* New York: Macmillan.

Valente, T.W., & Bharath, U. (1999). An evaluation of the use of drama to communicate HIV/AIDS information. *AIDS Education and Prevention,* 11, 203-211.

Valente, T.W., Poppe, P.R., Alva, M.E., deBriceno, R. V. & Cases, D. (1995). Street theater as a tool to reduce family planning misinformation. *International Quarterly of Community Health Education,* 15, 279-289.

Treatment Intervention/Interventions		Outcomes
Exposure to trigger video and reinforcement interview Groups #2 and #3 v.s. Group #1 (control)	) EH_1) EH_2) EH_3) EH_4	Knowledge of breast cancer scale Knowledge of mammography scale Positive attitude toward breast cancer scale Discuss breast cancer with friends and family members
Exposure to trigger video and reinforcement interview Group #3 v.s. Groups #1 and #2 (control)	) EH_{5a}	Mammography compliance
Exposure to trigger video and reinforcement interview Group #3 v.s. #1 (control)	) EH_{5b}	
Exposure to trigger video and reinforcement interview Groups #3 v.s. 2 (video only)	) EH_{5c}	Obtain a mammogram or report Intention to get a mammogram
Exposure to trigger video Group #2 v.s. #1 (control)	) EH_{5d}	
Exposure to trigger video and Reinforcement interview Groups #2 and #3 v.s. #1 (control)	) EH_{5e}	

Figure 1

Diagram of the hypothesized effects of an entertainment-education video plus follow-up reinforcement interviews

Group	T1 Pre-Measure	T2 Post-Measure	Reinforcement Interview	T3 Follow-Up Measure
1: Control	O1	O2		O3
2: Video only	O1, X1	O2		O3
3: Video & Follow-Up Interview	O1, X1	O2	X2	O3

O1 = Pre-test questionnaire

O2 = Post-test questionnaire

O3 = Follow-up telephone questionnaire, 1 weeks after the education program for Groups 1 and 2, and 1 week after the reinforcement interview for Group 3

X1 = Entertainment-education video intervention

X2 = Reinforcement interview urging compliance

Figure 2

Study Design

Table 1
Mean change scores in breast cancer knowledge from T_1 to T_3 for Groups 2 and 3 versus Group 1

Group	Mean Change Score (breast cancer Knowledge)	Std. Dev. σ	Difference in Mean scores Grps 2/3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 1: Control (N=58)	0.21	0.59	0.24	2.01	Yes
Group 2: Video Only N=57 Group 3: Video + Follow-up Interview N=60	0.45	0.80			

Range: 2 to 8, df=173.

Table 2
Mean change scores in mammography knowledge from T_1 to T_3 for
Groups 2 and 3 versus Group 1

Group	Mean Change Score (mammography knowledge)	Std. Dev. σ	Difference in Mean scores Grps 2/3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 1: Control (N=58)	0.16	0.52			
			0.34	2.96	Yes
Group 2: Video Only N=57 Group 3: Video + Follow-up Interview N=60	0.50	0.80			

Range: 3 to 12, df=173.

Table 3
Mean change scores in positive attitudes toward breast cancer
from T_1 to T_3 for Groups 2 and 3 versus Group 1

Group	Mean Change Score (positive attitude about breast cancer)	Std. Dev. σ	Difference in Mean scores Grps 2/3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 1: Control (N=58)	0.17	0.54	0	0.068	No
Group 2: Video Only N=57					
Group 3: Video + Follow-up Interview N=60	0.17	0.73			

Range: 2 to 8, df=170.

Table 4
Mean change scores for discussions about breast cancer with family members and friends from T_1 to T_3 for Groups 2 and 3 versus Group 1

Group	Mean Change Score (discussions of breast cancer)	Std. Dev. σ	Difference in Mean scores Grps 2/3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 2: Video Only N=57 Group 3: Video + Follow-up Interview N=60	0.04	0.13			
			0.05	2.39	Yes
Group 1: Control N=58	0.09	0.12			

Range: 0 to 6, df=173.

Table 5
Mean change scores in mammography compliance
from T_1 to T_3 for Group 3 versus Groups 1 and 2

Group	Mean Change Score (mammography compliance)	Std. Dev. σ	Difference in Mean scores Grps 1/2 to Grp 3	t-test for difference in mean scores	Significant at the 5% level?
Group 3: Video plus follow-up interview N=60	0.52	1.22			
			0.08	0.45	No
Group 2: Video Only N=57					
Group 1: Control N=58	0.44	1.04			

Range: 1 to 4, df=167.

Table 6
Mean change scores in mammography compliance
from T_1 to T_3 for Group 3 versus Group 1

Group	Mean Change Score (mammography compliance)	Std. Dev. σ	Difference in Mean scores Grp 3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 3: Video plus follow-up interview N=60	0.52	1.22	0.21	0.96	No
Group 1: Control N=58	0.31	1.05			

Range: 1 to 4, df=110.

Table 7
Mean change scores in mammography compliance
from T_1 to T_3 for Group 3 versus Group 2

Group	Mean Change Score (mammography compliance)	Std. Dev. σ	Difference in Mean scores Grp 2 to Grp 3	t-test for difference in mean scores	Significant at the 5% level?
Group 3: Video plus follow-up interview N=60	0.52	1.22			
			0.4	0.21	No
Group 2: Video only N=57	0.56	1.01			

Range: 1 to 4, df=110.

Table 8
Mean change scores in mammography compliance
from T_1 to T_3 for Group 2 versus Group 1

Group	Mean Change Score (mammography compliance)	Std. Dev. σ	Difference in Mean scores Grp 2 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 2: Video only N=57	0.56	1.01			
			0.25	1.29	No
Group 1: Control N=58	0.31	1.05			

Range: 1 to 4, df=109.

Table 9
Mean change scores in mammography compliance
from T_1 to T_3 for Groups 2 and 3 versus Group 1

Group	Mean Change Score (mammography compliance)	Std. Dev. σ	Difference in Mean scores Grp 2/3 to Grp 1	t-test for difference in mean scores	Significant at the 5% level?
Group 1: Control N=58	0.31	1.05			
			0.23	1.28	No
Group 2: Video Only N=57					
Group 3: Video + follow-up interview N=60	0.54	1.12			

Range: 1 to 4, df=165.

Promise or peril:
How newspapers frame stem cell research

Kimberly R. Taylor
Master's Student - Science and Health Communication
College of Journalism and Communications
University of Florida

Submitted for:
AEJMC 2003 National Convention
Science Communication Interest Group
July 30-August 2, 2003
Kansas City, Missouri

Contact:
Kimberly R. Taylor
University of Florida
Box 14425
Gainesville, FL 32604-4425
(352) 392-0838
krtaylor@ufl.edu

Abstract

Newspapers have long been the public's dominant source of scientific knowledge. In recent times, biotechnology issues have been featured with growing frequency. The purpose of this exploratory study was to examine how issues surrounding stem cell research have been portrayed in two major newspapers. A textual analysis was performed on 49 articles published from August 2000 through September 2001, using both qualitative and quantitative methods. The analysis found that a frame of uncertainty dominated coverage.

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Promise or peril:
How newspapers from stem cell research

Introduction

The area of human stem cell research has been a hot news topic since its public debut in November 1998 when Dr. James A. Thomson, a developmental biologist at the University of Wisconsin at Madison, first reported the isolation of human embryonic stem (ES) cells. This and subsequent research in the field has received extensive coverage, namely because of the great potential of stem cell research and the inherent controversies surrounding it.

Unlike other cells in the human body, stem cells are "the human body's primordial master cells" (Stolberg, 2001). They are unique in their ability to transform into a wide variety of cell types and to renew themselves almost limitlessly. From a basic research perspective stem cells can help scientists gain greater understanding of cell division and embryonic development, providing insight into critical topics such as how cancer cells spread and multiply. Stem cells could also prove useful as a way to test new therapeutic drugs prior to animal or human testing.

In addition to broadening scientific knowledge, stem cells have the potential to be used directly for therapeutic purposes. The ability of stem cells to transform into just about any specific cell type makes them capable of repairing or replacing cells or tissues that have been damaged or destroyed. Researchers suggest that stem cell research could ultimately lead to cures for diseases and disabilities such as Parkinson's disease, Alzheimer's disease, diabetes, multiple sclerosis, spinal cord injury and many more.

However, this potential panacea has been mired in ethical and moral concerns. Although the great majority of patient advocacy groups and the scientific community support stem cell research, numerous conservative groups oppose it. This includes abortion rights opponents, the Catholic Church, and several Republican leaders of Congress. Many have voiced concern over the sources of embryonic stem cells used for research. There is also concern that we are "playing God" and that embryonic stem cell research will lead us down a slippery slope ending in the cloning of humans.

It should be noted that some members of these conservative groups oppose embryonic stem cell research but support adult stem cell research. A basic tenet of many religions is to heal and to prevent suffering; adult stem cell research is a way to potentially cure diseases without the need to sacrifice embryonic tissue to do so. Unfortunately, recent evidence suggests that adult stem cells do not have the same versatility as embryonic stem cells and will not offer the same therapeutic potential.

Still other members of conservative groups are proponents of both adult and embryonic stem cell research, despite their existing opposition to abortion. For example, Senators Orrin Hatch (R-Utah) and Strom Thurmond (R-S.C.) support embryonic stem cell research and argue that "it would be anti-life not to pursue it" (Pianin, 2001). It seems that personal experiences can trigger these deviances from party values. Former Senator Connie Mack (R-FL), a self-proclaimed pro-life Republican, and his family have been profoundly touched by cancer. He sees embryonic

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stem cell research as a way to free patients from the wrath of devastating diseases. This blurring of party lines has only added to the uncertainty and indecision plaguing the debate over stem cell research.

Background on stem cell research

For many years, scientists studying human development did so via animals. This early research revealed a new class of cells capable of developing into any cell type in the body, dubbed "pluripotent" stem cells. In 1998, researchers were able to isolate and grow human pluripotent stem cells in the laboratory. Subsequent work has shown that these cells indeed have the capability of developing into nearly any cell or tissue type in the body, hinting at great possibilities for therapeutic applications.

Pluripotent stem cells namely come from embryonic or fetal tissue. Embryonic stem cells (ES cells) are retrieved from a group of cells known as the inner cell mass (part of the blastocyst) about four to five days after an embryo's fertilization. These cells can differentiate from their current unspecialized state into virtually any type of cell or tissue. The first possible source of such cells is surplus embryos that are a by-product of in vitro fertilization (IVF) labs. The second potential source is uniting donated eggs and sperm to create embryos directly in the lab. A third potential source of embryonic stem cells is a process called somatic cell nuclear transfer (SCNT), also known as therapeutic cloning. Here, genetic material from a body cell is transplanted into an egg cell that has had all of its genetic information removed. This technique is often referred to as cloning because the resulting embryo is genetically identical to the original body cell. The final source of pluripotent stem cells is the embryonic germ (body) cells that can be taken from aborted fetuses. Under the right laboratory conditions, embryonic stem cells can reproduce indefinitely, a trait not shared by adult stem cells.

Adult stem cells are undifferentiated cells found in specialized tissue, such as the blood or brain. These can yield specialized cell types, though in a much more limited fashion. Adult stem cells can typically replicate for the life of the organism but do not share the same infinite ability as embryonic stem cells. Despite these inherent differences, media coverage does not always discern between embryonic and adult stem cell research. This may serve to complicate the public's understanding and attitudes toward the already charged discussions about stem cell research.

Embryonic stem cell research hinges on various ethical dilemmas. Many conservative and religious groups argue that once an egg is fertilized, the resulting embryo should be considered a human being. This is much the same controversy that has swirled around the issue of abortion. The American Life League sees the embryo as "the tiniest person", worth standing up for and defending (Toner, 2001). Opponents are concerned not only about the use of existing embryos left over from in vitro fertilization, but also about the creation of embryos expressly for research purposes. Pope John Paul II refers to the latter as "an evil akin to euthanasia and infanticide" (Stanley, 2001). President Bush said that he recoils at the idea of "creating life for our own convenience" (Charo, 2001). Additional concerns exist that this will only be the beginning of a "Frankenscience" that ultimately will lead to cloning humans.

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Proponents, on the other hand, point out that many naturally fertilized embryos fail to implant in the uterus and thus never have the capability of developing into a human life. This argument is also extended to embryos generated in fertility clinics and which are inviable and will never result in life. Often, hopeful parents end up with more frozen embryos than they will have implanted. Proponents argue that these should be available for ES cell research since most otherwise will be discarded.

Certain opponents of ES cell research have argued that adult stems hold just as much promise. However, recent scientific articles have shown that this may not be the case. It may only be ES cells that have full pluripotency.

Much of the media's coverage has attentively focused on the potential risks. Risk is by no means a new concept to our society:

> "Risks to health, safety and the environment abound in the world and people cope as best they can. But before action can be taken to control, reduce or eliminate risks, decisions must be made about which risks are important and which risks can be safely ignored" (Covello and Johnson, 1987, p. vii).

Various stakeholders are typically involved in such discussions of risk. In this instance, involved groups have included the scientific community, federal government, political groups, patient advocacy groups, and religious groups. The important questions to be asked are, "Whose voice rises above all others," and, "How will this affect public opinion and policymaking?" In great part, the media and their framing of the issue influence these outcomes. According to Bridges and Nelson (2000), "Framing theorists suggest that the way an issue is presented – the frame – especially through the media, can affect public perceptions of the issue" (p. 100).

Framing Theory

Framing is a tool used by the media to present selective elements of an issue or event and in doing so, help swing the reader's opinion to align with a specific perspective. Indeed, Entman noted that framing can be distilled to selection and salience:

> "To frame is to select some aspects of a perceived reality and make them more salient in a communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or treatment recommendation for the item described" (Entman, 1993, p.56).

Hertog and McLeod (2001) characterized the "importance of frames and framing in social process, especially in defining and channeling social controversy" (p. 139). Frames can help the public to understand new and otherwise complex issues by capitalizing on widely accepted dogmas and shared perspectives. Frames reduce issues to the familiar, creating "cultural rather than cognitive phenomena" (p. 141). Frames might reference myths, narratives, or metaphors, or

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simply connect a reader with "the morals, ideals, stories, and definition of her culture" (p. 141). In all, it is their widespread recognition that gives frames such power.

Hertog and McLeod note that although framing analysis has been accepted as a useful research tool for several decades, it is far from being an exact science. A "wide array of theoretical approaches and methods" are utilized and the field has yet to settle on "a core theory or even a basic set of propositions, nor has a widely accepted methodological approach emerged" (Hertog and McLeod, 2001, p. 139). The current study will examine several specific framing methods.

Framing methods can be distilled to such basic elements as the language that journalists use to describe events (Edelman, 1988). Indeed, "the use of *baby* versus *fetus* signals a very different approach to the topic of abortion" (Hertog and McLeod, 2001). We are a culture that relies heavily on language. Yet complex scientific issues pose a great challenge to the public, who often cannot comprehend the associated terminology. Hertog and McLeod (2001) echoed this by saying:

> "All communication is dependent upon shared meaning among communicators. The speaker and the audience must approach words, icons, ideas, gestures, and so on in an identical fashion in order to communicate. The greater the difference in their individual understanding of symbols, the less able they are to communicate" (p. 141).

Also interesting to examine is how frequently statements from stakeholders emerged in the general media. Andsagar and Smiley (1998) stated, "The news media tend to rely on frames that the most influential policy actors provide, which will often render large institutions the most influential policy actors" (p. 183). This ultimately can have great influence on policy because "when the resonance process is complete, one frame comes to dominate debate, and decision makers set public policy to conform to it" (Miller and Reichert, 2001, p.113).

Research Questions

Specific research questions included:

> **Research Question 1**: How has the elite national print media framed stem cell research?
> **Research Question 2**: What frames dominate the elite media's coverage of stem cell research?
> **Research Question 3**: With what frequency did the media cite key stakeholders?
> **Research Question 4**: To what degree have the issues regarding embryonic stem cells and adult stem been differentiated?
> **Research Question 5**: How frequently was the process of human cloning cited alongside stem cell research? Was it differentiated as a separate issue or lumped together?
> **Research Question 6**: How frequently did coverage mention stances taken by other nations or allude to the threat of the United States being left behind?

Methodology

This study examined the way in which issues surrounding stem cell research have been portrayed in major newspapers. Newspapers were selected over other media because they are the public's dominant source for science knowledge (Blum, 1997).

The New York Times and the *Washington Post* were examined. Since the issue is one that has national and even international importance, *The New York Times* was selected for its reputation, breadth and overall depth of readership. *The Washington Post* was selected for its attention to political and legislative issues. As the predominant paper in Washington D.C., policymakers are apt to read it and to be influenced in how they respond to current issues.

The coverage time frame was August 25, 2000 through September 19, 2001. The start date coincided with the Clinton administration's removal of the ban on federal funding for embryonic stem cell research. The study end date extended one month past the Bush administration's August 19, 2000 reimposition of the ban. This month-long period following the ban allowed inclusion of articles that discussed the controversy over the limited number of existing ES cell lines, their relative viability, and the subsequent determination that adult stem cells might not hold the promise once believed.

The Lexis-Nexis Academic online database was used to identify articles. The database was screened using the term "stem cell" and the database's "headline, lead paragraph(s), terms" search parameter. News, feature stories, and opinions/editorials were all included in this study because the researcher felt these types of articles would be most likely to include detailed coverage of stem cell research issues. General letters to the editor were not included.

Articles of less than 500 words were excluded. The researcher felt longer stories would have more space to cover the critical elements of this miry topic. Future studies may include articles in the 100 to 500 word range. The initial sampling yielded 108 articles from *The New York Times* and 92 articles from the *Washington Post*. For this exploratory study the researcher sampled 25% of each group's articles, taking the earliest article and every fourth article thereafter. This yielded 27 articles from *The New York Times* and 24 articles from *The Washington Post*. During analysis it was determined that one article from each publication was only weakly related to stem cell research. These articles were dropped, leaving 26 articles remaining from *The New York Times* and 23 articles from *The Washington Post*.

Individual articles were the unit of analysis. Each was coded using a standard coding worksheet that examined: (1) sources of direct and paraphrased quotations; (2) general references to shareholder groups; (3) the definition and characterization of stem cell research and its associated implications; (4) utilization of key terminology; (5) delineation of the differences between adult and embryonic stem cells; (6) references to human cloning; and (7) references to other nations, namely their stances on stem cell research.

Results

Research Question 1: How has the elite national print media framed stem cell research?

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Several frames permeated the media's coverage of the subject. The researcher dubbed these the "clone and kill", "miracle cure", and "uncertainty" frames. Although each frame had its own key terminology, a central element among all was the sanctity of human life.

The "clone and kill" frame was more prevalent in articles citing conservative groups and opponents of stem cell research. Groups cited in the articles included: abortion rights opponents, conservative Republican members of Congress, the Catholic Church and other religious groups. These opponents argue that "a tragic coarsening of consciences" makes it "permissible to kill so long as we intend to bring good from it." They counter this by restating the basic principle of medicine, "to do no harm".

Despite the fact that stem cell research could yield promising new therapies, opponents of stem cell research maintain that it is morally and ethically wrong to use human embryonic tissue for research. This frame describes stem cells as "nascent" and "innocent" human life that must be protected. The sacrifice of these "unborn embryos" and "tiny human beings" only "devalues and violates human life". Family Research Council president, Kenneth Connor, wrote that "no commercial gain or scientific benefit can justify the slaughter of the innocent" (Connor, 2001).

An element of fear is introduced in this frame through the use of specific terminology. One *Washington Post* editorial referenced the human experimentation conducted at Auschwitz and then suggested that stem cell research could lead to scientists "playing God," using cloning "to provide spare human parts". The warning of "fetal farming" also persists, suggesting that the overwhelming demand for embryos would result in for-profit businesses to breed new embryos for research. It would be interesting to examine the stance these same groups take towards third-party egg donations to infertile couples. It is likewise feasible that demand for eggs could result in the growth of the industry, albeit for creating rather than destroying life. Either way, humans are creating life through science and potentially "playing God".

An alternate frame was the "miracle cure" frame, which emphasized the promise of stem cell research. This frame was favored in articles relying heavily on sources from within the scientific and academic communities. The quotes from scientists and ethicists are used to demonstrate that although there are strong moral and ethical considerations, the ends of stem cell research justify the means. Millions of ailing Americans one day could benefit from the potential therapies generated from stem cell research.

This point is reiterated through the use of common-ground stories, namely from politicians and such well-known individuals as Nancy Reagan, Christopher Reeve and Michael J. Fox. These quotes humanize the issue by offering personal examples of families touched by devastating diseases. This serves to build rapport with readers, demonstrating that just about everyone will have a family member or friend who might benefit from the advances in stem cell research.

Specific phrases used in the "miracle cure" frame include: "promise of miracle cures"; "nascent but promising field"; "fountain of youth"; "magical power"; "limitless potential"; "dazzling array (of new treatments)"; "stem-cell revolution"; "so versatile"; "potential to cure disease and relieve suffering"; and "breakthrough therapies and cures".

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The "miracle cure" frame also attempted to downplay the moral arguments by addressing the concept of when life truly begins. Critical to this argument is whether embryos are sentient beings with souls. One *Washington Post* article cited that "the idea that an embryo has a soul is a matter of religious faith, not science", and implied that this question should not stand in the way of federal funding (Silver, 2001). This frame maintains that a key distinction exists between the origin of a human being, an embryological question, and the origin of a human person, a philosophical question (Irving 1999). Indeed, "no court has ever suggested that they (embryos) have human rights and it would be unethical to protect them at a sick person's expense" (Weiss, 2001).

This frame also used carefully selected terminology. Rather than imply that the tissue necessary for this research was obtained from a controversial source (i.e. a fetus), this frame used such phrases as: "microscopic ball of cells"; "activated embryo"; and "blastocyst".

The "excess embryos" frame was often a complementary frame used in articles exhibiting the "miracle cure" frame. The "excess embryos" frame was grounded in the overproduction of embryos for infertility treatments. Many embryos generated for IVF are defective and would never be viable. Other times, couples undergoing IVF simply end up with more embryos than are needed. This frame emphasizes that stem cell research would be able to utilize these embryos, saving them from certain destruction and unnecessary waste.

The most widely used frame was the "uncertainty" frame. Webster's dictionary lists such synonyms for uncertainty as doubt, dubiety, skepticism, and mistrust. Certainly all of these nuances permeated the media's coverage of stem cell research during the period of time that President Bush deliberated on what policy to set or immediately thereafter.

Earlier coverage using the uncertainty frame focused on the difficulty in sorting out the moral and ethical concerns over stem cell research. Conservative groups opposed to stem cell research argued for preserving the sanctity of human life and protesting the destruction or creation of human embryos for research purposes. However supporters contested that:

> "when it comes to biology, words like "destruction," "creation," "embryo" and even "life" and "death" are ambiguous. Scientists understand this ambiguity to be a reflection of the complexity of living things. Meanwhile, both advocates and opponents of stem cell research are using that ambiguity to their best advantage" (Silver, 2001).

Adding to the confusion inherent in this frame were the repeated citations of conservative Republicans crossing party lines. Senators Orrin Hatch and Strom Thurmond both support embryonic stem cell research. In doing so they seem to be acting in opposition to their anti-abortion views and thus aligning themselves with liberal groups in support of stem cell research. This is not unheard of since "social groups may exhibit different ideologies and yet apply the same frame to a particular topic (Hertog and McLeod, 2001, p.144).

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Another element to this frame was Bush's continued indecision over whether or not to allow federal funding of stem cell research. This dubiety drove many in the media to describe how President Bush's "divided administration" was grappling with the "agony", "conundrum", and "quandary" of the "national debate." This led some to suggest that Bush's "credibility…is open to question."

During his campaign, Bush vowed to protect the sanctity of human life and reinforce pro-life values. Conservatives wondered why it was taking Bush so long to declare what they hoped would be a moratorium on embryonic stem cell research. This "cat and mouse" game led to skepticism on part of the media and perhaps the public. The media speculated about the delay, suggesting that it was simply "spin, an effort to justify a decision already made" (Cohen, 2001). Indeed, when Bush finally did issue his decision, the media yet again expressed its doubt. Frank Bruni, of *The NewYork Times* wrote, "his speech was like a Rorschach" leaving Bush "future wiggle room" (Bruni, 2001).

Later coverage featuring the uncertainty frame highlighted concern over whether Bush's decision provided enough latitude to maximize the potential of stem cell research. Articles expressed repeated skepticism on whether the 64 existing cell lines would be sufficient. Proponents of stem cell research felt Bush's "vision is shown to be too narrow". However, conservative groups felt that Bush had strayed too far from his party's pro-life values, calling for a complete ban on all embryonic stem cell research.

Research Question 2: What frames dominate the elite media's coverage of stem cell research?

Table 1. Frames sorted by publication.

	The Washington Post (23 articles)	The New York Times (26 articles)
Miracle cure (primary)	4	7
Clone and kill (primary)	1	1
Excess embryo (primary)	0	1
Uncertainty (primary)	17	17
Other (primary)	1	0
Miracle cure (secondary)	0	6
Clone and kill (secondary)	1	0
Excess embryo (secondary)	2	0
Uncertainty (secondary)	1	3
Other (secondary)	0	0

Table 2. Frames sorted by article type.

	News (38 articles)	Feature (1 article)	Editorial/Opinion (10 articles)
Miracle cure (primary)	8	1	1
Clone and kill (primary)	0	0	2
Excess embryo (primary)	1	0	0
Uncertainty (primary)	28	0	7
Other (primary)	1	0	0
Miracle cure (secondary)	6	0	0
Clone and kill (secondary)	0	0	1
Excess embryo (secondary)	1	0	2
Uncertainty (secondary)	4	0	0

Research Question 3: With what frequency did the media cite key stakeholders?

Table 3. ***New York Times*** articles citing stakeholder groups.

	Number of articles with direct quotations	Number of articles with paraphrased quotations	Total number of direct quotations within articles	Total number of paraphrased quotations within articles
Religious groups	4	1	5	1
Scientific groups	14	10	37	23
Industry	4	3	11	6
Government	9	4	22	5
Patients' advocacy groups	5	2	6	2
Conservative advocacy groups	1	1	9	1
Historical figures	0	0	1	0
TOTAL	37	21	91	38

Table 4. ***Washington Post*** articles citing stakeholder groups.

	Number of articles with direct quotations	Number of articles with paraphrased quotations	Total number of direct quotations within articles	Total number of paraphrased quotations within articles
Religious groups	4	1	5	1
Scientific groups	14	10	37	23
Industry	4	3	11	6
Government	9	4	22	5
Patients' advocacy groups	5	2	6	2
Conservative advocacy groups	1	1	9	1
Historical figures	0	0	1	0
TOTAL	37	21	91	38

The data includes direct or paraphrased quotes of specific individuals or organized groups. Sources associated with scientific organizations included academic stem cell experts, scientists, and ethicists, as well as the National Institutes of Health, National Academy of Sciences, National Institute of Medicine, etc. Historical figures included Albert Einstein, Jonas Salk, Thomas Jefferson, Abraham Lincoln and others.

Research Question 4: To what degree have the issues regarding embryonic stem cells and adult stem been differentiated?

Table 5. Delineation of the differences between adult and embryonic stem cell research.

The Washington Post (23 articles)	The New York Times (26 stories)
8	9

Research Question 5: How frequently was the process of human cloning cited alongside stem cell research? Was it differentiated as a separate issue or lumped together?

Table 6. References to human cloning.

The Washington Post (23 articles)	The New York Times (26 stories)
5	9

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Research Question 6: How frequently did coverage mention stances taken by other nations or allude to the threat of the United States being left behind?

Table 7. References to other nations.

The Washington Post (23 articles)	The New York Times (26 stories)
5	9

Analysis

Research Question 1: How has the elite national print media framed stem cell research?
Research Question 2: What frames dominate the elite media's coverage of stem cell research?

As described in the results above, three frames have been characterized to describe the media's coverage of stem cell research. The majority of articles from both papers relied on "uncertainty" as a primary frame. Indeed, the rate of scientific uncertainty in the media is increasing (Friedman, 1999). Friedman argues that experts on each side of an issue introduce elements of uncertainty in an effort to sway public opinion.

The "uncertainty" frame was used most frequently in news stories, indicating that stem cell research can be seen as an emergent science. Susanna Hornig Priest described emergent science as "science whose truth has not yet been settled by consensus, either scientific or public" (Friedman, p.97). She states that emergent science is almost always dubbed newsworthy. The repeated appearance of stem cell research on the front pages certainly confirms this. Rather than take a stance, many of the news articles examined gave equal weight to the facts on both sides of the story. While it is important that the media provide accurate and complete information on a subject, declaring support or opposition for complex issues can help clarify ongoing debate and bring potential resolution. Hertog and McLeod (2001) refer to this as the resolution phase.

The other frames that appeared were the "clone and kill" and "miracle cure" frames. Each relied heavily on quotations from polar sources. "Clone and kill" favored conservative sources such as the Catholic Church and abortion rights opponents while "miracle cure" relied on more liberal sources such as academics and patient advocacy groups.

Frame use shifted over time. Many earlier articles utilized the "miracle cure", likely as a direct result of the newly available federal funds for stem cell research. This then shifted to "uncertainty" as a conservative, pro-life Republican president prepared to take office. Bush's extended debate over whether or not to allow federal funding only prolonged the use of the "uncertainty" frame. It was at this point that the "clone and kill" frame arose, as opponents of ES cell research voiced their opposition of ES cell research funding. Media coverage following Bush's decision was also dominated by the "uncertainty" frame. Numerous articles debated whether what Bush allowed would be enough. Concerns arose whether adult stem held the same promise as ES cells. Others questioned if the 64 existing cell lines eligible for federal funding would prove viable and readily available to scientists.

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Research Question 3: With what frequency did the media cite key stakeholders?

The New York Times relied most heavily on scientific groups for both direct (14 of 26 articles - 53.8%) and paraphrased quotations (10 of 26 articles – 38.5%). Scientific groups also constituted the greatest number of overall quotations in *The New York Times* for both direct (37 of 91 quotations – 40.7%) and paraphrased quotations (23 of 38 quotations – 60.5%).

Conversely, *The Washington Post* relied most heavily on government sources. Direct quotations from government groups were present in 60.9% of the articles (14 of 23 articles). Paraphrased quotations were present in 17.4% of the articles (4 of 23 articles). Government sources also dominated the total number of direct quotations with 38.8% (26 of 67 quotations). Government groups tied with scientific groups for total number of paraphrased quotations (each 36.8% - 7 of 19 quotations).

It can be inferred that *The Post* featured higher coverage of government sources because of its geographic location and reader base.

Research Question 4: To what degree have the issues regarding embryonic stem cells and adult stem been differentiated?

No significant difference existed between how each paper delineated adult stem cell research from embryonic stem cell research, with each one close to 34%. It is somewhat surprising that this rate was so low. As described in the background section, large differences exist between embryonic and adult stem cells, namely in source and potential for research. This lack of delineation could lead to greater confusion of the issues among readers.

Research Question 5: How frequently was the process of human cloning cited alongside stem cell research? Was it differentiated as a separate issue or lumped together?

The Washington Post referenced human cloning in 21.7% of its articles (5 of 23 articles) while *The New York Times* referenced it in 34.6% of its articles (9 of 26 articles). Most articles that cited human cloning made a brief attempt to differentiate it from stem cell research. However, this could have been done in a much more exacting manner in a greater number of articles. By specifying that stem cell research and human cloning are entirely separate, this could have stemmed some of the controversy over stem cell research funding.

Research Question 6: How frequently did coverage mention stances taken by other nations or allude to the threat of the United States being left behind?

The Washington Post referenced other nations in 8.7% of its articles (2 of 23 articles) while *The New York Times* referenced them in 23.1% of its articles (6 of 26 articles). Overall, it did not seem that either paper was overly concerned with how the efforts in the U.S. will stack up to those of other countries. This is somewhat disturbing as the U.S. risks getting left behind if it deliberates too long on this subject.

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Conclusion

Overall, the topic of stem cell research framing in the media carries great importance. As mentioned earlier, stem cell research has the potential to transform the medical field entirely. Despite the previously discussed ethical risks surrounding the advance of stem cells research it is equally important to consider what will occur if we do no move forward in this area. This idea is echoed by Chris MacDonald, an ethicist at Dalhousie University, who said, "In the field of biotechnology, nothing short of inaction can guarantee that we won't make decisions that end up seeming, in retrospect, to have been mistakes" (MacDonald, 2001). Overbearing policy will greatly hinder scientific progress, preventing therapies and cures for a vast array of medical conditions and diseases from ever being realized. In the meantime, scientists in other countries will be hard at work making these specific discoveries. At first blush, this seems benign. The discoveries can always be applied within the U.S. However, it likely would take longer for potential therapies to be implemented; therapies developed outside the U.S. often trigger greater skepticism and a longer review process by the FDA. In all, it is important to study the specific framing of this issue as it has the power to influence the subsequent public policy decisions made in this country.

This topic lends itself to further exploration. As mentioned earlier, expanding the sample size would yield a richer overall picture. Examining articles of 100 to 500 words could be insightful. Although many Americans tend to get their news from shorter stories, these same stories would offer less space for detailing this complex issue. It would be interesting to see if authors were able to distill critical elements into a succinct It also might be useful to study the framing of elite media in other regions of the U.S. (Chicago, Los Angeles, etc.), rather than just the East Coast. Because the papers examined in this study tended to frame the topic in a more progressive and liberal manner, a study of media in more traditionally conservative climates like the Midwest and the South could yield different results. And finally, an alternate perspective could be achieved by studying elite media in other countries. In countries such as England and Sweden, the governments already have tackled the thorny issues surrounding stem cell research and have introduced regulatory measures and legislation.

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Bibliography

Andsagar, J. & Smiley, L. (1998). "Evaluating the public information: Shaping news coverage of the silicone implant controversy," *Public Relations Review*, 24(2), 183-201.

Blum, D. and Knudson, M. (1997). *A Field Guide for Science Writers*. New York: Oxford University.

Bridges, J.A., & Nelson, R.A. (2000). "Issues management: A relational approach." In J.A. Ledingham & S.D. Bruning (Eds.), *Public relations as relationship management: A relational approach to the study and practice of public relations* (pp.95-115). Mahwah, NJ: Lawrence Erlbaum.

Bruni, Frank (2001, August 10). "THE PRESIDENT'S DECISION: NEWS ANAYLSIS; Of Principles and Politics," *The New York Times*.

Charo, Alta R. (2001, August 12). "Are we playing God? Or playing human?" *The Washington Post*.

Cohen, Richard (2001, July 17). "The stem cell student," *The Washington Post*.

Connor, Kenneth (2001, August 10). "Stem cells: Bush's broken promise" *The Washington Post*.

Covello, V.T., & Johnson, B.B. (1987). "The social and cultural construction of risk: Issues, methods, and case studies." In B.B. Johnson & V.T. Covello (Eds.), *The social and cultural construction or risk: Essays on risk selection and perception* (pp.vii-xii). Dordecht, Holland: Reidel.

Edelman, M. (1988). *Constructing the political spectacle*. Chicago: University of Chicago Press.

Entman, R. (1993). "Framing: toward clarification in a fractured paradigm," *Journal of Communication*, 43, 51-58.

Friedman, S., S. Dunwoody, C. Rogers (1999). *Communicating uncertainty: Media coverage of new and controversial science*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Hertog, J. & McLeod, D. (2001). A multiperspectival approach to framing analysis: A field guide. In S. Reese, O. Gandy, & A. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world*. Mahwah, NJ: Erlbaum.

Irving, D. (1999). "When do human beings begin," *International Journal of Sociology and Social Policy*, 19 (3-4), 22-46.

MacDonald, Chris (2001). "Stem cells: A pluripotent challenge": *BioScan* Vol. 13, issue 4.

Miller, M., & Riechert, B. (2001). "The spiral of opportunity and frame resonance: Mapping the issue cycle in news and public discourse," in S. Reese, O. Gandy and A. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the social world*. p. 107-121. Mahwah, NJ: Erlbaum.

National Institutes of Health (2001, June). *Stem Cells: Scientific Progress and Future Research Directions*. Department of Health and Human Services. Retrieved December 8, 2002 from http://www.nih.gov/news/stemcell/scireport.htm.

The New York Times (2001, August 8). "From cloning to cures," editorial.

Pianin, Eric (2001, July 30). "House Speaker Reveals Opposition to Stem Cell Research," The Washington Post.

Priest, Susanna Hornig (1999). "Popular Beliefs, Media, and Biotechnology," in *Communicating uncertainty: Media coverage of new and controversial science*. p. 95-112. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Silver, Lee M. (2001, August 19). "Watch what you are calling an embryo; and other subtleties that define the debate." *The Washington Post*.

Stanley, Alessandra (2001, July 24). "BUSH'S TRAVELS: VISIT TO JOHN PAUL; Bush hears Pope condemn research in human embryos," *The New York Times*.

Stolberg, Sheryl Gay (2001, September 3). "New Stem Cell Issue," *The Washington Post*.

Toner, Robin (2001, February 18). "Bush caught in the middle on research on stem cells," *The New York Times*.

Weiss, Rick (2001, June 21). "Bush backs broad ban on human cloning; prohibition would cover embryos for research." *The Washington Post*.

Communicating Forest Management Science and Practices through Visualized and Animated Media Approaches to Community Presentations: An Exploration and Assessment

By
Donald E. Zimmerman, Carol Akerelrea, Jane Kapler Smith, Garrett O'Keefe

Donald E. Zimmerman, Professor
Center for Research on Writing and Communication Technologies
Department of Journalism & Technical Communication
Colorado State University
Fort Collins, CO 80523-1785
Telephone 970-491-5674
FAX 970-491-2908
e-mail Don.Zimmerman@Colostate.edu

Carol Akerelrea, Research Associate
Center for Research on Writing and Communication Technologies
Department of Journalism & Technical Communication
Colorado State University
Fort Collins, CO 80523-1785

Jane Kapler Smith, Ecologist
U.S.D.A. Forest Service, Rocky Mountain Research Station
Fire Sciences Laboratory
P.O. Box 8089, Missoula, MT 59807
(406) 329-4805; fax (406) 329-4877
e-mail: jsmith09@fs.fed.us

Garrett O'Keefe, Professor and Chair
Department of Journalism & Technical Communication
Colorado State University
Fort Collins, CO 80523-1785
Telephone 970-491-3703
FAX 970-491-2908
e-mail: Garrett.O'Keefe@colostate.edu

Presented to Science Communication Group
Association for Education in Journalism and Mass Communication
Kansas City, August 2003

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[1] We wish to thank Jim zumBrunnen, statistician, for his assistance in the data analysis. We thank Paula Fornwalt, Merrill Kaufmann, Laurie Huckaby, and Jason Stoker at the Rocky Mountain Research Station, Fort Collins, CO, for providing data and photographs. We thank Nick Crookston and the Joint Fire Sciences Project for supporting this research.

Abstract:

Communicating Forest Management Science and Practices through Visualized and Animated Media Approaches to Community Presentations: An Exploration and Assessment

Natural resource managers have used a variety of computer-mediated presentation methods to communicate management practices to diverse publics. We explored the effects of visualizing and animating computerized presentations in explaining forest succession, fire behavior, management options, and mathematical models. Rural mountain, town, and student participants In an experimental design using purposive samples, rural mountain, town and student groups appeared to have gained substantial information from the presentations, with inter-group differences depending on presentation mode.

Keywords: Visualization, animation, presentations, forest management models, Microsoft Power Point

Communicating Forest Management Science and Practices through Visualized and Animated Media Approaches to Community Presentations: An Exploration and Assessment

Communicating science to the public can take many avenues depending upon purposes of the communication and the audience(s) involved. When the goal is greater involvement of the public in science-related policy decisions at the local level, increased importance is being accorded to formal presentations of information and issue positions by expert sources at community meetings. Such presentations are becoming more technologically sophisticated, taking advantage in particular of the latest in portable computer software and media for visual depictions. This research examines a pilot effort involving the use of animation in such visual portrayals and its relative effectiveness. The setting is one of the more common in building participative decision-making: the communication of natural resource management practices to an impacted public.

Advances in computer technology now enable natural resource managers to use a variety of software to enhance their management of natural resources and to communicate management practices to diverse publics. For example, managers use complex models to predict forest change, fire behavior, and the effects of management decisions. Members of the public need to understand the nature of these models and be able to interpret their output. Hobbs (2000) notes that lack of understanding impedes collaborative planning: "Any analytical procedure for setting conservation priorities must be understood by everyone affected by it.... In a democracy, all decisions must be explainable to be credible." This study investigated the effectiveness of computer presentation technology and custom visualization software for presenting output from a forest growth and fire behavior model to the public.

Public presentations have long been an important mode of communicating natural resource management information to diverse publics. Over the years, resource managers have used a variety of communication and presentation methods, including 35mm slide shows, overhead transparencies, hook and loop boards, films, videos, posters, and flip charts (Fazio and Gilbert 2000, 1986, 1981; Gilbert 1964, 1971). Managers now use laptop personal computers, portable projection units, and presentation software in their public presentations. Advances in presentation software allow presenters to use illustrative techniques including animations, still line art, sound, video, and World Wide Web sites. Such techniques provide the opportunity to enhance the presentation of complex natural resource management techniques such as modeling.

Modeling

As ecologists learn more about the complexity of forest ecosystems, the task of responsible management becomes increasingly complicated. Managers must anticipate the responses of forests to change at many temporal and spatial scales, account for social and economic considerations, and recommend actions to meet specific (and often conflicting) objectives (Mowrer 1997).

Managers now rely on mathematical models and computer-based information systems to help with these tasks (Barrett 2001). Models are, in many cases, the only way to predict effects of management choices over large areas and long time periods (McCarter et al. 1998, Mladenoff & Baker 1999). Mathematical modeling is also crucial for effective fire management and suppression efforts (Andrews and Queen 2001). Recent technology integrates fire spread models with forest process models, creating more powerful but more complex tools for managers and planners (Keane & Long 1998; Reinhardt et al. 2001).

Communicating Modeling with the Public

Hobbs (2000) and McVicker (2000) call for dialogue with the public, public understanding, and public acceptance as necessary for responsible management of public lands. Presentations that explain models and summarize model output are a common component of dialogue with the public, and presenters now use computer-generated line drawings ("visualizations") to depict specific model predictions and animated sequences of drawings ("animations") to portray ecological processes (Bergen et al. 1998; McGaughey 1998). For example, in a recent planning process for the Tenderfoot Creek Experimental Forest, central Montana, the Forest Vegetation Simulator (FVS) was used to predict results from several forest management strategies. The Stand Visualization System (SVS) was used to prepare visualizations of modeled pre- and post-treatment conditions (Andrews and Queen 2001).

McGaughey (1998) points out two important uses of visualizations: (1) project the visual effects of forest treatment options during the design process, and (2) help managers communicate their intentions to other resource specialists and the public. He stresses that visualizations must be accurate lest stakeholders' (interested publics) expectations exceed what is physically and biologically possible. Bergen et al. (1998) quote Sheppard (1986, 1989) as saying the fundamental objectives of visual simulations are understanding, credibility, and lack of bias. McCarter et al. (1998) used FVS to depict model output and claimed that their approach facilitated outreach and education. While these authors assert the effectiveness of presentations, they did not report data documenting the effectiveness of visualizing model results in communicating with key publics.

Andrews and Queen (2001) assert that modeling aids communication among decision-makers, land management agencies, and the public, but such dialogues are complex and sensitive. Information that scientists view as factual and objective may be perceived differently by non-scientists. As Weber and Word (2001) comment, "... the fate of science information is a complex matter." Barrett (2001) argues that, if models of vegetative change for forest management planning are to be used to educate the public about forest ecosystem dynamics, then developers should focus on effective user interface, documentation, and research on effective communication techniques.

Therefore a need exists to empirically assess the effectiveness of formal presentations. We asked, "Does a formal presentation about forest modeling indeed increase knowledge about forest processes in members of the public? To what extent do computer visualizations and animations enhance a formal presentation about model output? In what ways do formal

presentations influence public attitudes toward forest management and the USDA Forest Service?"

Communication and Education Research Findings

Studies of formal presentation techniques, visualization, and animation have a tradition in both communication and education research. While the work is often sketchy with sometimes conflicting findings, a brief review of that literature in insightful here.

Presentation Studies. Surprisingly few researchers have investigated the effectiveness of formal presentations using presentation software programs. The studies we have found were published in trade magazines or as corporate technical reports.

In *Presentations*, a trade magazine, Simons, Andres, and Petersen (2000) report on a project commissioned by *Presentations* and 3M to explore the impacts of information presented in a text pamphlet, overhead transparencies, and multimedia presentations (professionally designed Power Point slides using graphics and animations) in three different studies with college students at a western university. While the authors do not report statistical significance, the multimedia presentation tended to score higher for free recall and information comprehension in a training study and an informational meeting study. A third study investigated persuasional marketing. In one part of the study, nearly two-fifths of the participants preferred the vendor presented in a multimedia presentation over the vendor presented in an overhead transparency presentation; in a second part, 80% of participants preferred the vendor touted in a multimedia presentation over that presented in a printed pamphlet.

One study found that presentations using overhead transparencies were more persuasive than presentations without overhead transparencies and that the overheads enhanced the understanding of abstract concepts, maintained higher listener interest and increased audience retention (Minnesota Mining and Manufacturing 2002, Vogel, Dickson and Lehman 1986).

Visualization Studies. Research on computer interfaces provides further insights. Chen and Yu (2000) conducted a meta-analysis of studies of visualization research. They investigated 35 studies and found that, given the same cognitive abilities, users tend to perform better with simpler visual interfaces. They called for further investigations to explore visualization effectiveness and potential differences based on the cognitive abilities of individuals.

Animation Studies. Animation in computer based instruction has been defined as a series of rapidly changing images that suggest movement (Rieber and Hannafin 1988). Most research on teaching with animation has focused on computer-based instruction in K-16 classroom settings, while some research has focused on adult learners in formal settings.

In reviewing empirical studies, Rieber (1990) recommends the use of animations when they are congruent with the learning task, when learners new to a topic may not know how to attend to relevant cues, or when animation's contribution to computer based instruction may lie in interactive graphic applications—i.e. the user controls the interactivity. Rieber, Boyce, and Alinki (1991) studied the potential benefit of computer based training using the above principles to introduce the concepts of force, inertia, velocity and acceleration and their relationships. The researchers found that animations did not provide an advantage over static visuals for

undergraduate students, and reported that this was consistent with earlier research in training settings (Rieber, Boyce, and Assad 1990, Moore, Nawrocki, and Simutis 1979, Reed 1985).

Based on a detailed literature review of animation in instructional environments, Large (1996) argues that, to contribute to learning a specific topic, animation must overlap with the text (i.e. provide redundancy), be consistent, and provide relevant, concrete detail. He speculates that animation might help people learn topics that involve changes over time and cannot be easily visualized. However, he also points out that personal factors influence learning; those most relevant to presentations would include prior knowledge, experience, motivation, and attitude. Adults can store, retain, and retrieve information better than children and are better able to form internal images from carefully designed and highly imaginable text, so they may have less need for visual aids and animation than children. Large notes that most multimedia studies with adults have been investigations of participants who are used to retrieving information from text—primarily undergraduates and graduate students.

We found no studies investigating the impact of animations in informal learning and education settings, such as public presentations.

Research Questions

This study explored the effect of presentations, with and without visualized and animated computerized graphics, in explaining forest growth and change, fire behavior, and mathematical models to samples from three adult populations (groups). The specific research questions follow:

RQ1. Were there significant differences in knowledge within groups between participants who viewed a visualized presentation and participants who viewed a non-visualized presentation?

RQ2. Were there significant differences between groups after viewing the visualized presentation?

RQ3. Were there significant differences between groups in after viewing the non-visualized presentation?

RQ4. Were their significant differences within and between groups in their perception of the Forest Service and the role of models adding to the credibility of the Forest Service?

Methods

The study consisted of having purposive sample groups from three adult populations--rural mountain residents, town residents, and students-- first complete part of a questionnaire, then view either a visualized or non-visualized presentation, and then complete the rest of the questionnaire. The questionnaire covered knowledge, foils, media usage, and background. The research protocol was reviewed and approved by the university institutional review board.

Populations Studied

Forest fires burn thousands of acres of public and private lands along the eastern slope of Colorado's Rocky Mountains every few years. The study area lies along the eastern slope, within or adjacent to forests managed by state and federal agencies. Our participants included rural mountain residents, town residents, and college students. The rural mountain residents lived in the Rocky Mountains of northern Colorado, on property adjacent to and sometimes interspersed within national forests above 6,000 feet sea level. The town residents lived in a metropolitan area, population about 120,000, in the adjacent foothills 5,000 feet above sea level. The college students were recruited from communication classes in a liberal arts college within a land grant university in the same metropolitan area. Because of the risks posed by forest fires, we felt these residents would have a compelling interest in how the USDA Forest Service makes forest and fire management decisions. All data were collected prior to April 15, 2002. Between April 15 and September 30, 2002, some 300,000 acres of forested lands throughout Colorado burned; the largest fire southwest of Denver, Colorado, burned some 140,000 acres, including the area described to the public in this study.

Study Design

We recruited 142 participants for the study and divided each population sample group into two subgroups. One subgroup viewed a "visualized" MS© 2000 Power Point presentation (containing line drawings and animations produced by computer software directly from data and model results) while the other group viewed a "non-visualized" presentation (also in Power Point, but containing no line drawings or animations) (Table 1).

Table 1 Population Groups and Treatments

	Visualized/ Animated	Non-visualized / Non-Animated	Totals
Rural Mountain Residents	27	21	48
Town Residents	27	36	63
Students	19	12	31
Totals	73	69	142

Local community organizations recruited resident participants for the study. Each community organization received $100 for recruiting participants, and each participant received a $10 honorarium for helping with the study. Students were recruited from undergraduate journalism and speech classes by announcing the project in classes and asking for volunteers. Each student received a $10 honorarium.

Presentation Design

We developed a basic presentation that first introduced the use of models in forest management and then used the Forest Vegetation Simulator (FVS) with Fuels and Fire Extension (FFE) to show how forests grow and change, how fires affect this change, how forest structure affects fire behavior, and how management decisions influence forests and fires. FVS (Stage 1973, Wykoff et al. 1982) is a mathematical model that simulates forest growth and productivity and the effects of potential management actions on forest dynamics. It is used widely in the United States and Canada to prepare forest management plans, assess habitat, and estimate impacts from insects and pathogens (Dixon 2002, Mowrer 1997). The recent Fire and Fuels Extension to FVS (FFE) simulates surface vegetation available for combustion ("fuels"), tree characteristics, fire behavior, and tree mortality in the event of fire as a forest changes through time (Reinhardt et al. 2001). FVS-FFE uses the Stand Visualization System (SVS, McGaughey 1997, 1998) to produce visualizations and animations directly from data and model output. Simulations were run using data from the Cheesman Reservoir area southwest of Denver, Colorado (Kaufmann and others 2000a, 2000b, 2001).

The basic presentation included black and white photographs depicting forest conditions in 1900 and current conditions; color photographs illustrating tree species, tree growth patterns, fires, and management practices; conceptual diagrams; text overview slides using bullet lists to cover key concepts; and bar graphs. The 11 bar graphs used both vertical and horizontal formats (Figure 1). We used the animation tool in Power Point to reveal specific information progressively.

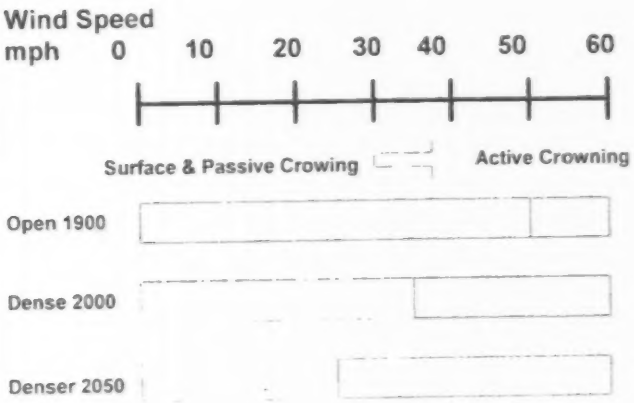

Figure 1 Example of a horizontal bar graph illustrating the modeled wind speed at which active crown fire (severe fire behavior that consumes tree crowns and kills most above-ground plant parts) is likely to occur in forests with different structures. The "open 1900" forest was dominated by large trees with little tree regeneration (170 trees/ac); the "dense 2000" forest has more than twice as many large trees with hundreds of small trees (409 trees/ac); the "denser 2050" forest modeled by FVS has even more trees of all sizes (547 trees/ac).

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From the basic presentation, we constructed a non-visualized version and a visualized version. The 40-minute, 64-slide non-visualized presentation included 91 (63 color and 28 black and white) photographs. The 45-minute, 71-slide visualized presentation included 65 (50 color and 15 black and white) photographs—fewer than the non-visualized presentation because many concepts were depicted by line art illustrations from SVS (31 still illustrations and 13 animated illustrations). These illustrations were constructed directly from the data and showed the forest in 1900 and current conditions, modeled succession (Figure 2), modeled management treatments, and modeled fire behavior (Figure 3). The line art consisted of illustrations viewed from several angles (Figure 2). Because the animated screens of the visualized presentation displayed quickly, we showed each animation twice before moving ahead in the presentation.

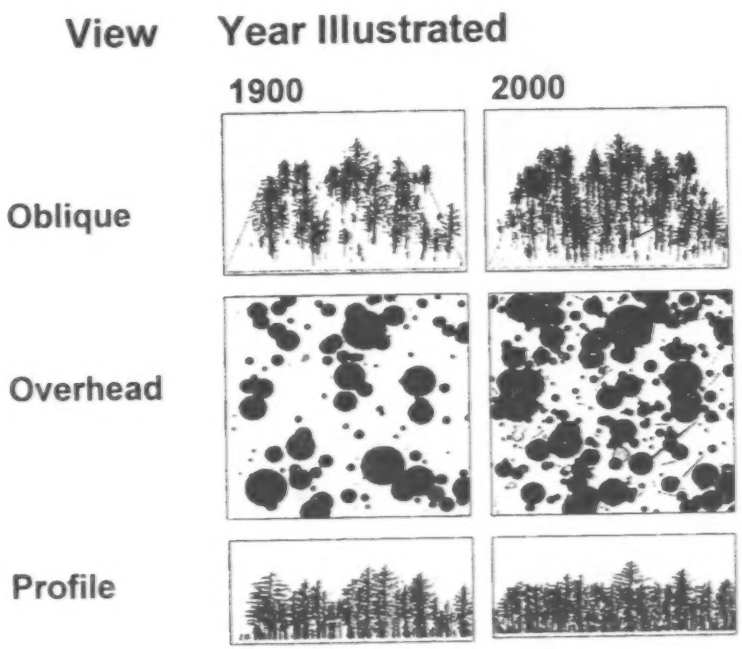

Figure 2. Line art example from visualized presentation illustrating forest succession (change over time). Each illustration represents data describing tree density over a 1-acre area. The 1900 forest and 2000 forest are viewed from an oblique aerial angle (top), overhead (middle), and profile view. The visualized presentation used the 1900 and 2000 images in each pair as the first and last image in a 10-image animation of succession.

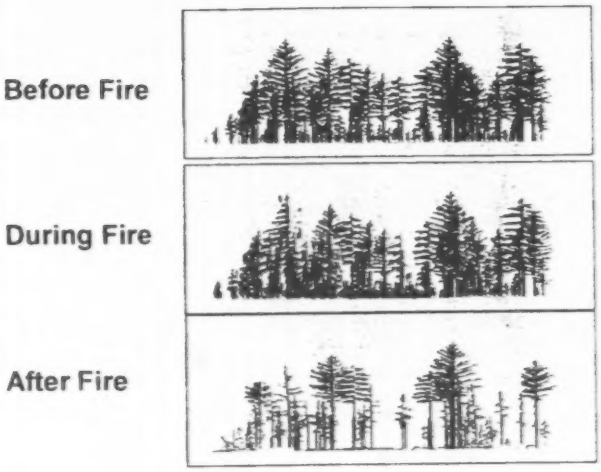

Figure 3 Line art examples from visualized presentation illustrating modeled fire behavior. The presentation used these 3 images in a 10-image animation of fire spread through a forest.

Smith provided all presentations for the rural mountain residents and the town residents, and the visualized presentation to students. Zimmerman gave the non-visualized presentation to students. Both presenters talked from a script to maintain consistency.

Questionnaire Design

To assess the effectiveness of the presentations, we developed a questionnaire in which the first 30 questions measured participants' level of general knowledge. Of these, 22 questions focused on the content of the presentation: forest growth and change ("succession"), fire behavior, forest management, and use of models for decision making. Eight questions served as foils—on topics not covered in the presentation—to ascertain the influence of asking the same questions before and after the presentation.

The questionnaire introduction acknowledged that some people were knowledgeable about forests, forest fires, and forest management, while others were not. Then it asked participants to read each question. If they did not know the answer to the question or they were unsure of their answers, participants were instructed to circle the "Don't Know" response. If they thought they were familiar with the topic of the statement, they were instructed to rate the question on a 1 to 7 scale where 1 meant "not at all true" and 7 meant "usually true."

We pre-tested the questionnaire twice to enhance the wording of individual questions. The content-related and foil questions constituted the entire pre-presentation survey and part of the post-presentation survey. The post-presentation survey included additional questions: 14 questions asked about the presentation itself, 9 asked about the visual aids used in the presentation, and 2 asked about the presentation in relationship to the credibility of the USDA Forest Service.

We asked a panel of experts (n = 3) in forest and fire ecology to answer the knowledge-related questions, so we could compare participant responses to those of experts.

Audience members' frame of reference—knowledge, attitudes, prior experiences, and cognitive skills--can influence their receipt and processing of new information and thus confound the potential impact of presentations. Therefore, the post-presentation part of the questionnaire asked participants about their prior experience with forests and fires; ownership of rural mountain property and the amount of their mountain lands covered with forests; whether their property had been threatened by forest fires or burned by forest fires; how likely they were to pay attention to news media coverage of forest fires; prior exposure to issues related to the environment and forest fires; and concern about forest fires.

Prior experiences with governmental agencies may influence how participants react to and process the information provided in the presentation. Therefore, the post-presentation part of the questionnaire asked participants about their experience with the USDA Forest Service, the helpfulness of the Forest Service in managing forests on private property, and the agency's management of fires in national forests. It also asked if they had heard, read, or seen any news coverage about the Forest Service.

Demographic questions in the post-presentation part of the questionnaire explored where participants lived, their educational level, and completion of high school and/or college biology, botany, conservation, and agriculture courses. Additional questions assessed participants' concern about the environment, their involvement in their respective communities, and their ability to visualize or "see pictures" in their minds when thinking about forests. Finally, participants were asked to report their ethnic background, annual household income, gender, and age.

Treatment Setting

Each participant attended a single presentation. Depending upon participant availability, sessions were held in the early afternoon or early evening. Whenever possible, sessions were part of the recruiting organization's regular meetings. Students attended lunch hour presentations. Complimentary refreshments were provided at all sessions for adult residents while students received complimentary pizza and soft drinks. To acquire sufficient participants for the study, we gave two visualized presentations to the rural mountain and student groups, and two non-visualized presentations to the town group. Statistical analyses of independent variables and potential confounds showed no significant differences between participants in the first and second sessions; therefore the data were combined.

Each session began with a welcome and an introduction from the principal investigator followed by an overview of the session and an introduction of the research team. The researchers explained we were seeking help with a research project on communicating potential forest management practices to the general public. Most participants sat at tables facing a 5' by 5' projector screen. When tables were not available, participants sat in chairs with clipboards for writing surfaces. Following the introduction, participants were informed that the presentation

was part of the research project, briefed on being involved in research, and then given the required Human Subjects participation consent forms to read and complete. In addition they received their honorarium and receipt form for the honorarium.

After participants returned the consent form and receipts, the researchers instructed participants to complete the first 30 questions of the questionnaire (measuring their level of general knowledge), then stop and not look further at the questionnaire. The questionnaire also instructed participants to stop after completing the initial 30 questions. The researchers monitored participants as they completed the questionnaire. No participants were observed reading beyond the first 30 questions.

After the presentation, researchers instructed participants to answer the remaining questions, taking as long as they needed. After participants completed their questionnaires, the researchers collected them and provided each participant with a written explanation of the research project. Once all participants turned in their questionnaires, the presenter answered questions from the audience. No session took more than 90 minutes.

Data Analysis

Our first analysis provided two scores. First, we compared the percentage of "Don't Know" responses before and after the presentation. Second, we analyzed the scores based on participants' 1 to 7 rating of each question for which they thought knew the answer. We reversed scoring for negative statements to produce all scores in the same direction. We ran ANOVA and post hoc tests to determine if the responses within groups and between groups were significantly different. The pre-test scores were treated as covariates. For nominal data, we ran pair-wise Chi square tests comparing the percentage responses within groups. The level of significance was set at $p = .05$. We also analyzed questions and responses according to cognitive levels.

Results

All scale post-presentation scores were relatively high, in the M = 4.74 to M = 6.30 range (on the 1 to 7 scale where 1 = not at all true to 7 = usually true).

For all groups, the mean after-scores for the succession, fire behavior and model scales were significantly higher than the mean before-scores for the three scales (Figure 4). On the forest management scale, we found no significant differences between the before and after scale scores. We found no significant differences in the pre-scores between groups for any subject-matter scale (succession, fire behavior, management, and model).

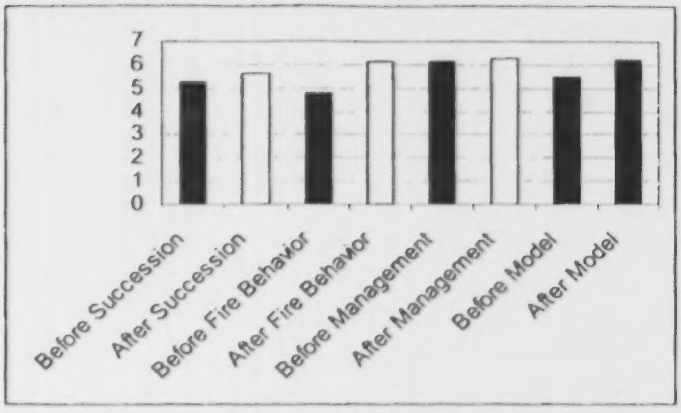

Figure 4 Mean Scores before and after Presentations for All Participants

Significant reductions in the percentage of "Don't Know" responses for individual questions were observed for all groups, regardless of treatment. For both visualized and non-visualized presentations, the total number of "Don't Knows" for individual questions dropped by 87% on questions regarding succession, 87% on questions regarding fire behavior, 78% on questions regarding management, and 95% on questions regarding modeling after participants viewed the presentations.

The panel of three experts, who reviewed the Power Point presentations and then answered the information-related questions, gave no "Don't Know" responses. They had mean knowledge scores for succession M = 7.0, fire behavior M = 6.96, management M = 7.0, and models M = 6.95.

Impact of Visualized Presentations on Knowledge

The rural mountain participants viewing the visualized presentation, when compared to rural mountain participants viewing the non-visualized presentation, scored significantly higher on the knowledge questions regarding fire behavior, fire management, and simulation models (Table 2). No significant differences were observed between the visualized and non-visualized scores for college students and town residents.

We found no significant differences within the groups when we assessed the confounds. Specifically, we found no significant differences in their paying attention to reports of forest fires, owning forested property, seeing images of forests in their minds when thinking about forests, perceptions of the Forest Service's helpfulness in protecting private property, the Forest Service's responsibility for fire management, concerns about environmental issues, nor community involvement.

Table 2 Comparison of Mean Knowledge Scores within Groups after the Presentation.[1]

Concept	Rural mountain Residen		Town Residents		Students	
	Non-Visualized	Visualized	Non-Visual	Visualized	Non-Visualized	Visualized
Succession	5.84	5.80	5.73	5.56	4.65	4.93
Fire behavior	**5.90**	**6.31**	6.14	6.13	5.74	6.10
Management	**5.85**	**6.55**	6.40	6.51	6.51	6.18
Models	**5.94**	**6.56**	6.27	6.28	6.18	6.13

[1] Differences Significant at the $p = .05$ level signified by bold means; ANOVA

Differences between Groups Viewing the Visualized Presentation

Rural mountain residents and town residents scored significantly higher than students on the succession knowledge questions after viewing the visualized presentation (Table 3). No significant differences emerged between groups on the other knowledge scales. While not significantly higher, a general pattern emerges in which the rural mountain residents tended to score slightly higher than town residents and students on all post presentation knowledge scores.

Table 3 Comparison of Mean Knowledge Scores between Groups after Viewing Visualization Presentation.[1]

Concept	Rural mountain Residents	Town Residents	College Students
Succession	5.80[a]	5.56[a]	4.93[b]
Fire behavior	6.31[a]	6.13[a]	6.10[a]
Management	6.55[a]	6.51[a]	6.18[a]
Models	6.56[a]	6.28[a]	6.13[a]

[1] Super script same, no significant difference at $p > .05$; superscript different, significant at $p > .05$

Differences between Groups Viewing the Non-Visualized Presentation

In the non-visualized presentation, as in the visualized presentation, rural mountain and town participants scored significantly higher on knowledge of succession than students (Table 4). No significant differences emerged between groups on the remaining knowledge questions.

Table 4 Comparison of the Mean Knowledge Scores between Groups after Viewing the Non-Visualized Presentation.[1]

Concept	Rural mountain Residents	Town Residents	College Students
Succession	5.84 [a]	5.73 [a]	4.65 [b]
Fire behavior	5.90 [a]	6.14 [a]	5.74 [a]
Management	5.85 [a]	6.40 [a]	6.51 [a]
Models	5.94 [a]	6.27 [a]	6.18 [a]

[1] Super script same, no significant difference at $p > .05$; superscript different, significant difference at $p = .05$

Foil Questions

To assess the potential impact of answering the pre-presentation part of the questionnaire, we used eight foil questions. Three of the eight questions produced significant increases from the pre to post section of the questionnaire with responses to the remaining five questions not significantly different.

Perception of the Presentations and Visuals

Participants rated both presentations and the visuals in each presentation highly. The groups viewing the visualized presentations rated them as significantly more visually pleasing than the groups viewing the non-visualized presentations (M =5.96±1.14 vs M = 5.32±1.59, t = -2.73, df = 137, p = .007). No other significant differences emerged between the groups viewing the visualized versus the non-visualized presentations (Figure 5), although the group viewing the visualized presentation rated the presentation slightly higher, on average, than the group viewing the non-visualized presentation.

Perceptions of Visuals

Participants rated the visuals used in the presentations highly (Figure 6). The groups viewing the visualized presentations rated visuals significantly more attractive (M = 5.73 vs 4.92, t = -2.83. df = 128.40, p = .005) and easier to follow than did the groups viewing the non-visualized presentations (M = 6.26 vs 5.66 t = -2.23 p = .028). While the ratings of the visuals on the 7 other variables were not significantly different, the group viewing the visualized presentations tended to rate the visuals slightly higher than the group viewing the non-visualized presentations.

When comparing perceptions of visuals by rural mountain residents, town residents, and students, only two variables differed significantly between the visualized and non-visualized presentations. The town residents viewing the visualized presentation rated the visuals significantly better organized than did the town residents viewing the non-visualized groups (F=2.50, df =5, 133, p =.033; M= 6.55 vs. 5.72, Duncan p = .05). The town residents viewing

the visualized presentation rated the visuals significantly higher in improving their understanding than did the town residents viewing the non-visualized groups ($F=2.40$, df =5, 134, $p = .040$; M= 6.48 vs. 5.39, Duncan $p = .05$).

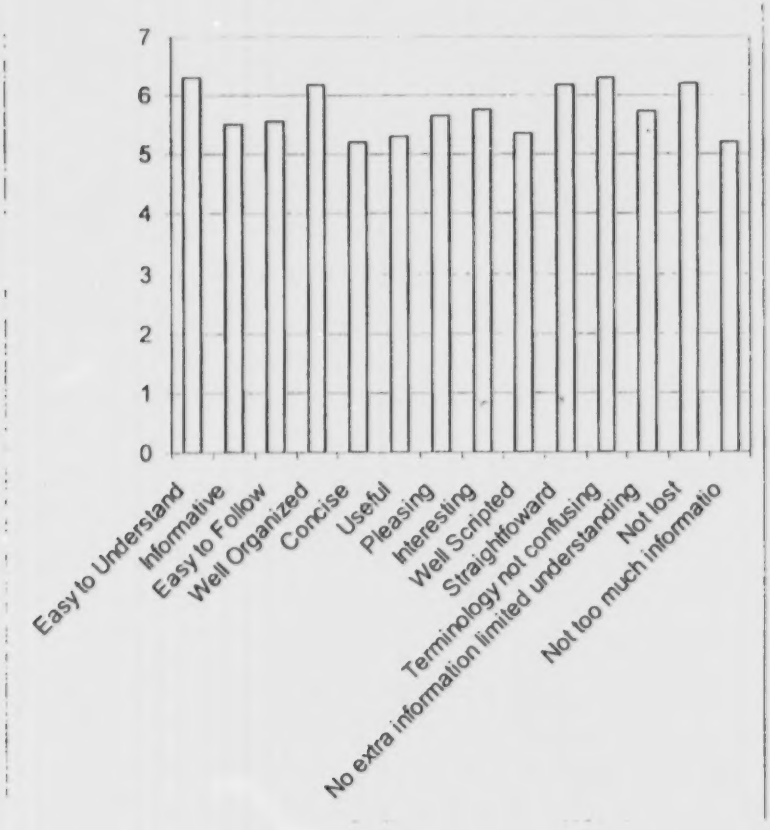

Figure 5 Perceptions of the Presentation, average of all groups and treatments. 0="Don't Know," 1="not at all true," 7="usually true."

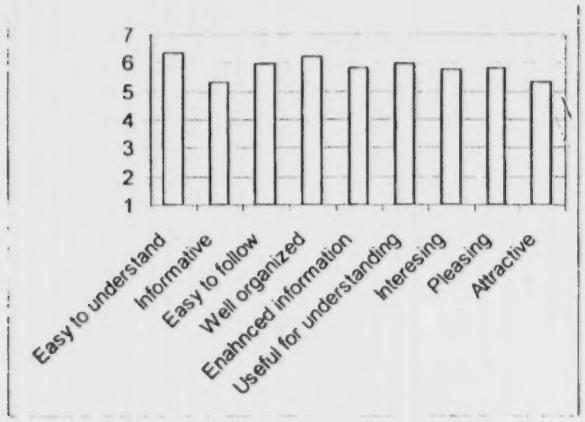

Figure 6. Perceptions of the Visuals, average of all groups and treatments. 1="not at all true," 7="usually true."

Presentation and Perceptions of USDA Forest Service

Based on the presentation, participants rated the Forest Service and the agency's use of models highly. We found no significant differences within nor between groups in their perception of the USDA Forest Service (M = 5.93±1.57, Range 5.40 to 6.83 using a 1 to 7 scale where 1 = strongly disagree to 7 = strongly agree), and no significant differences in agreement that models, such as those described in the presentation, added to the credibility of the Forest Service (M = 6.06±1.19, Range = 5.60 to 6.31).

When comparing responses within and between groups, the rural mountain visualized participants (M = 3.96) and rural mountain non-visualized participants (M = 4.37) rated the Forest Service as significantly less helpful in protecting private property than did the town visualized participants (M = 5.58) (F = 2.986, p= .014, df = 5, 128, Duncan p = .05) using the 1 to 7 scale where 1 = not at all helpful to 7 = very helpful. Further, the rural mountain visualized participants (M = 3.96) rated the Forest Service as significantly less responsible in regard to fire management than all other groups (M = 4.84 to 5.79), using a 1 to 7 scale where 1 = not at all responsible to 7 = very responsible (F = 4.80, df = 5, 131; p = .000).

Demographics

Demographic characteristics of participants differed between groups but varied little within groups (Table 5). No significant differences were found in the rural mountain or town resident groups between the visualized and the non-visualized participants for age, education, income, gender, and ethnicity. Within the student participants, the non-visualized group had significantly more female participants than the visualized group. None of of the town residents or college students listed mountain homes as their primary residence, whereas 98% of rural mountain residents did so. Three of the town residents and four students reported having a mountain cabin as their secondary residence. Eight percent of the rural mountain residents'

property had been threatened by forest fires and 11% of their property had been burned by forest fires.

Table 5. Demographic Information about Participants.[1]

	Rural mountain Residents	Town Residents	College Students
Average age (yr)	61[a]	44[b]	21[c]
Income > $50,000 (%)	46[a]	63[b]	10[c]
Bachelor's degree or higher (%)	42[a]	71[b]	13[c]
Completed high school biology course (%)	60[a]	78[b]	97[c]
Completed college biology course (%)	23[a]	52[b]	55[c]
White non-Hispanic (%)	95[a]	83[a]	90[a]
Female (%)	52[a,c]	73[b]	55[a,b]
Male (%)	48[a,c]	27[b]	45[a,b,c]

[1]Super script same, no significant difference at $p > .05$; superscript different, significant at $p > .05$.

Discussion

For natural resource managers to engage in meaningful dialogue with the public about the conditions of forest lands and plans for future management, all parties must understand basic principles of forest succession, fire behavior, and forest management techniques—including the use of computerized models. Our study, while limited in scope, demonstrates that carefully planned and developed presentations, whether visualized or non-visualized, can help the USDA Forest Service communicate complex ecological and management information to diverse publics to improve their understanding of forest management practices.

Developing and presenting a carefully planned presentation is not a trivial matter. We spent more than 120 hours over some 12 weeks drafting, polishing, and refining the visualized and non-visualized presentations to increase their effectiveness. We designed visuals that helped illustrate, reinforce, and complement the concepts presented in the narrative. We worked at length with SVS (visualization program) parameters to obtain clear illustrations. We sought photographs that represented the terrain and vegetation common to mountains in or near where the participants lived. The data used for modeling were obtained from similar forests within 100 miles of where the participants lived. Although we scripted the narrative, the presenters used the script as notes to guide their presentations rather than read the script verbatim. We believe this special attention and effort in developing and giving the presentations played a key role in making them effective.

Both the visualized and the non-visualized presentations increased participants' knowledge and perception of their knowledge (as shown by increased knowledge scores and reduction in "Don't Know" responses) for three public audiences-- rural mountain residents, town residents, and students. Participants' gain in perception of their knowledge may explain the fact that they achieved significantly higher post-presentation scores even for some foil questions, which addressed information not treated in the presentations.

Participants reported that both the presentations and the described model added to credibility of the Forest Service. Even the rural mountain residents, who tended to rate the Forest Service as less helpful than the city residents and students, followed this pattern.

This study demonstrates that use of visualization and animation techniques can increase the appeal of a technical, information-packed presentation to the public. Participants ranked the visualized presentation more visually appealing overall than the non-visualized presentation, and ranked visual aids more attractive and easier to follow in the visualized presentation. These differences did not translate into consistently greater knowledge or higher ranking of the agency's credibility by viewers of the visualized presentation, however, as marketing research suggests might occur (Simons, Anfres, and Petersen 2000).

The visualized presentation was associated with significant knowledge gain over the non-visualized presentation only for the rural mountain participants. Perhaps these participants were less able to interpret information in the non-visualized presentation because they tended to be older and have less educational background in biology than town residents and students. This is congruent with Rieber's (1990a) claim that animation may be particularly useful when learners may not know the relevant cues for assimilating information. It also indicates that research focusing on students and young, well-educated adults may not represent responses of the public in general. Large (1996) pointed out that most research on animation with adults has been conducted with undergraduate and graduate students (a convenient audience to sample), who may be better skilled at retrieving information from textual communications and forming internal images from text than other groups of adults. Rural mountain residents viewing the visualized presentation showed greater knowledge gain than those viewing th[illegible]n-visualized presentation in regard to fire behavior but not in regard to succession—both topics that involve change over time. Thus, our research does not unequivocally confirm Large's (1996) assertion that animation may be especially effective for presenting topics that involve change over time.

Communication researchers have long suggested audience differentiation based on a range of characteristics (Friedson 1972) and have suggested segmenting audiences and presenting different mixes of information for different audiences, based on their awareness of a topic and its relevance to them (Grunig 1989). Natural resource managers must recognize that specific publics and stakeholder groups will interpret and use agency information on an issue in light of their pre-existing information, opinions, and attitudes on the topic and their perceptions of the risks associated with management decisions to themselves, their communities, and the environment. The media mix that benefits different publics may vary from one topic to another (Keefe, Ward and Shepard 2002; O'Keefe, Boyd and Brown 1998).

Communication research over the past 30+ years suggests that even a well prepared, skillfully delivered presentation can only be part of effective communications with the public. Increasing public knowledge of natural resource management practices does not ensure agreement with those practices, so dialog is essential. Stamm (1972) cautioned that information is only part of a complex array of factors influencing attitudes and public perceptions of natural resource issues. After studying hundreds of studies of diffusion of information and hardware, Rogers (1995) cautions against top-down technology transfer and calls for community change agents--community advocates with similar backgrounds as the publics--to help facilitate changes.

Juanillo and Scherer (1995) called for a dialectal communication—i.e. a democratic exchange of information, opinions and issues among the different stakeholders-- when communicating risk about scientific and environmental issues. They point out that many issues involve risks to the local residents or communities. In such cases, they argue for empowering stakeholders with the skills and background that will enable them to appreciate different perspectives, scrutinize opinions and perceptions about risks, and sharpen their skills for making judgments about environmental issues.

Recent advances in computer programming provide increasingly sophisticated visualization and animation techniques. For example, the Microsoft Power Point Office Suite 2002 lists more than 30 different animation techniques for presentations. However, research on the effectiveness of these techniques in enhancing communication has been sparse. Our study, while limited in scope, demonstrates a generally positive response to use of visualization/ animation by adults. It also illustrates the potentially complex outcomes of using these techniques to communicate specific knowledge, and the potential differential effects of using these techniques with different audiences.

Conclusions

A carefully designed presentation can enhance public understanding, and perceptions of understanding, of complex ecological information and natural resource management practices. Use of visualization and animation in technical presentations can increase the appeal of the presentations, though it may not necessarily increase participant knowledge nor alter participants' attitudes. Future research needs to investigate the effectiveness of different presentation techniques in public presentations with different adult audiences. Special attention should focus on investigating the salience of the topic to adult audiences; using alternative research designs, such as the Solomon Four-group design or post-test only control group design (Campbell and Stanley 1963); and using larger, random samples.

References

Andrews, P. L., and L. P. Queen. 2001. Fire modeling and information system technology. *Internat. J. of Wildland Fire*. 10(3):343-352.

Barrett, T. M. 2001. Models of vegetative change for landscape planning: a comparison of FETM, LANDSUM, SIMPPLLE, and VDDT. General Technical Report RMRS-GTR-76-WWW. Ogden, UT: U.S.D.A. Forest Service, Rocky Mountain Research Station. 14 p.

Bergen, S. D., R. J. McGaughey, and J. L. Fridley. 1998. Data-driven simulation, dimensional accuracy and realism in a landscape visualization tool. Landscape and Urban Planning. 40:283-293.

Bloom, B., L. Andeson, and L.A. Sosniak. 1994. Excerpts from the "Taxonomy of educational objectives, The classification of educational goals, Handbook I: Cognitive domain. In *Bloom's taxonomy: A forty year retrospective. Part II* eds. L.W. Anderson, and L. W. Sosniak, 9-27. Chicago: The National Society for the Study of Education & The University of Chicago Press.

Campbell, S, and J.C. Stanley. 1963. *Experimental and quasi-experimental designs for research.* Chicago, IL: Rand McNally.

Chen, C., and Y. Yu. 2000. Empirical studies of information visualization: A meta-analysis. *Internat. J. of Human-computer Studies*. 53: 851-866.

Dixon, G. E., compiler. 2002. *Essential FVS: a user's guide to the Forest Vegetation Simulator.* Fort Collins, CO: U.S.D.A. Forest Service; Forest Management Service Center. 178 p.

Fazio, J. R., and D. L. Gilbert. 1981. *Public relations and communication for natural resource managers.* Dubuque, IA: Kendall/ Hunt.

Fazio, J. R., and D. L. Gilbert. 1986. *Public relations and communication for natural resource managers.* Dubuque, IA: Kendall/ Hunt.

Fazio, J. R., and D. L. Gilbert. 2000. *Public relations and communication for natural resource managers.* Dubuque, IA: Kendall/ Hunt.

Friedson, E. 1972. Communication research and the concept of mass. In *The process and effects of mass communication* eds. W. Schramm and D. F. Roberts, 198-208. Urbana: University of Illinois Press.

Gilbert, D. 1964. *Public relations in natural resource management.* Minneapolis, MN: Burgess.

Gilbert, D. 1971. *Public relations in natural resource management.* Washington, DC: The Wildlife Society.

Grunig, J. E. 1989. Publics, audiences and market segments: Segmentation principle for campaign. In *Information campaigns: Balancing social values and social change*. ed. C. T. Salmon, 199-228. Sage Annual Reviews of Communication Research. Vol. 18. Newbury Park: Sage.

Hobbs, N. T. 2000. Seven habits for successful collaboration with local governments. *J. of Forestry* "Focus" section. 98(4):1-2.

Hunter, R. L., and F.L. Schmidt. 1990. *Meta-analysis: Cumulating research findings across studies.* Newbury Park, California: Sage.

Juanillo, N. K., Jr., and C. Scherer. 1995. Attaining a state of informed judgments: Toward a dialectical discourse on risk. In *Communication Handbook/18* ed. B. R. Burleson, 278-299. Thousand Oaks, California: Sage.

Kaufmann, M. R.; P. J. Fornwalt, L. S. Huckaby, J. M. Stoker. 2001. Cheesman Lake– a historical ponderosa pine landscape guiding restoration in the South Platte watershed of the Colorado Front Range. In: Vance, Regina K.; Covington, W. Wallace; Edminster, Carleton B., tech. coords. Ponderosa pine ecosystems restoration and Conservation: steps toward stewardship; 2000 April 25-27; Flagstaff, AZ. Proceedings RMRS-P-00. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Kaufmann, M.R., L. Huckaby, P. Gleason. 2000a. Ponderosa pine in the Colorado Front Range: Long historical fire and tree recruitment intervals and a case for landscape heterogeneity. In *Crossing the millennium: integrating spatial technologies and ecological principles for a new age in fire management*, Vol. 1. eds. L. R. Neuenschwander, K.C. Ryan, G.E. Gollberg, and J. D. Greer, 153-160. Moscow, ID: University of Idaho and International Association of Wildland Fire.

Kaufmann, M. R.; C. M. Regan, and P. M. Brown. 2000b. Heterogeneity in ponderosa pine/Douglas-fir forests: age and size structure in unlogged and logged landscapes of central Colorado. *Canadian Journal of Forestry Research*. 30:698-711.

Keane, R. E., and D.G. Long. 1998. A comparison of coarse scale fire effects simulation strategies. *Northwest Science*. 72(2):76-90.

Large, A. 1996. Computer animation in an instructional environment. *LISR*. 18: 2-23.

McCarter, J. B., J. S. Wilson, P. J. Baker, J. L. Moffett, and C.D. Oliver. 1998. Landscape management through integration of existing tools and emerging technologies. *J. of Forestry.* 96(6):17-23.

McGaughey, R. J. 1997. Visualizing forest stand dynamics using the stand visualization system. In: *Proceedings of the 1997 ACSM/ASPRS Annual Convention and Exposition; 1997 April 7-10*; Seattle, WA. Bethesda, MD: American Society for Photogrammetry and Remote Sensing 4:248-257.

McGaughey, R. J. 1998. Techniques for visualizing the appearance of forestry operations. *J. of Forestry.* 96(6): 9-14.

McQuillan, A. G. 1998. Honesty and foresight in computer visualizations. *J. of Forestry.* 96(6):15-16.

McVicker, G. 2000. Community-based stewardship; a model for applied science. Presented at the Aurora Partnership national meeting, 2000 November 14-15; Charleston, SC.

Minnesota Mining and Manufacturing. 2002. Study shows just how much visuals increase persuasiveness. Available: http://www.3m.com/meetingnetwork/presentations/pmag_visualsstudy.html(Accessed 9/30/2002).

Mladenoff, D. J., and W. L. Baker, 1999. Development of forest and landscape modeling approaches. In *Spatial modeling of forest landscape change: approaches and applications,* eds. D. J. Mladenoff and W.L. Baker, 1-13. New York: Cambridge University Press.

Moore, M., L. Nawrocki, and Z. Simutis, 1979. *The instructional effectiveness of three levels of graphics displays for computer-assisted instruction* [Report No. ARI-TP-359, ERIC Document Service No. ED 178 057]. Arlington, Virginia: Army Research Institute for behavioral and social sciences.

Mowrer, H. T. (ed). 1997. Decision support systems for ecosystem management: an evaluation of existing systems. General Technical Report RM-GTR-296. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 154 p.

O'Keefe, G. J., H. J Ward, and R. Shepard. 2002. A repertoire approach to environmental information channels. *Science Comm. 23* (4): 392-409.

O'Keefe, G. J., H. H. Boyd, and H. Brown. 1998. Who learns preventive health care information from where: Cross channel and repertoire comparisons. *Health Communication.* 10:25-36.

Reed, S. 1985. Effect of computer graphics on improving estimates to algebra word problems. *J of Ed. Psych.* 77(3): 285-298.

Reinhardt, E. D., R.E. Keane, and J.K. Brown. 2001. Modeling fire effects. *International Journal of Wildland Fire*. 10 (3):373-380.

Rieber, L. P., and M. J. Hannafin. 1988. Effects of textual and animated orienting activities and practice on learning from computer-based instruction. *Comp. in Schools*. 5(1/2): 77-89.

Rieber, L., M. Boyce, and C. Assad. 1990. The effects of computer animation on adult learning and retrieval tasks. *J. of Computer-based Inst.* 17(2): 46-52.

Rieber, L. P. 1990. Animation in computer-based instruction. *ETR&C*. 38(1): 77-86.

Rieber, L. P. 1991. Effects of visual grouping strategies of computer-animated presentations on selective attention in science. *Ed. Tech. Res. & Develop.* 39(4): 5-15.

Rogers, E. 1995. *Diffusion of innovations.* (Fourth Edition) New York: The Free Press.

Rosenthal, R. 1991. *Meta-analytic procedures for social science research.* Newbury Park, CA: Sage.

Sheppard, S. R. J. 1986. Simulating changes in the landscape. In *Foundations for visual project analysis*, eds. R. C. Smardon and J. P. Palmer, 198-199. New York: Wiley. [cited in Bergen & others 1998]

Sheppard, S. R. J. 1989. Visual simulation: a user's guide for architects, engineers, and planners. New York: Van Nostrand-Reinhold. [cited in Bergen & others 1998]

Simons, T., H. Anfres, H., and C. Petersen. February 2000. Multimedia or bust. *Presentations.* 14: 40-49.

Stage, A. R. 1973. Prognosis model for stand development. Research Paper INT-137. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 32 p.

Stamm, K. R. 1972. Environment and communication. In *Current perspectives in mass communication research* eds. F. G. Kline and P. J. Tichenor, 265-294. Beverly Hills, CA: Sage.

Vogel, D. R., G. Dickson, and J. Lehman. 1986. *Persuasion and the role of visual presentation support: The UM/3M Study.* University of Minnesota's Management Information Systems Research Center.

Weber, J. R., and C. S. Word. 2001. The communication process as evaluative context: What do nonscientists hear when scientists speak? *BioScience*. 51(6):487-495.

Williams, V. M., and M. R. Abraham. 1995. The effects of computer animation on the particulate mental models of college chemistry students. *J. of Res. in Sci. Teach.* 32(5): 521-534.

Wykoff, W. F., N. L. Crookston, and A. R. Stage. 1982. User's guide to the stand prognosis model. General Technical Report INT-133. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 112 p.

Running Head: MANAGEMENT OF WEB HEALTH INFORMATION

Women Searching the World Wide Web for Health Information: Exploring Thoughts and Information Management

María E. Len-Ríos and Frances Gorman

The University of Kansas

Presented to the Science Communication Interest Group of the Association for Education in Journalism and Mass Communication, July 2003, Kansas City.

All correspondence to: Dr. María E. Len-Ríos, Assistant Professor, The University of Kansas, William Allen White School of Journalism and Mass Communications, Stauffer-Flint Hall, 1435 Jayhawk Blvd., Room 207D, Lawrence, KS, 66045-7535, (785) 864-7637, mlenrios@ku.edu. Frances Gorman is a master's degree student at the same institution, francesgorman@hotmail.com.

Abstract

This study uses think-aloud protocols to explore the thought processes of 12 women as they search the World Wide Web for information about leading healthier lifestyles. Normative management of information theory and the concept of self-efficacy guide our analysis. Use of the grounded theory method revealed that women seek information to increase their hope, satisfy their interests and curiosity, and provide them with knowledge. Participants primarily define leading a healthier lifestyle as weight loss, disease prevention, and good mental health. Findings also suggest that self-efficacy, in this context, can be internal and external.

Women Searching the World Wide Web for Health Information:

Exploring Thoughts and Information Management

Studies show that women are more likely than men to use the Internet for health information (McKillen, 2002; Morahan-Martin 1998; Fox et al., 2000). However, it is unclear how women search the Internet, use its information and make decisions about what information to read. This study examines how women search the Internet and process information about leading healthy lifestyles in order to add to theories of information management and better understand self-efficacy for nutrition and fitness behaviors. From a practical standpoint, our study addresses ways to think about implementing public health campaigns to reduce obesity.

We chose to study how women seek information about living healthier lifestyles because chronic heart disease, diabetes and obesity are among the greatest U.S. public health challenges. Wetter et al., (2001) noted that health behavior modification programs have been "marginally successful," with less than one-third achieving the desired results (pp. S11-S12). Wetter et al. (2001) wrote, "This situation may be seen as a 'crisis' in the fields of health, exercise, and nutrition science" (p. S11). Studying how women seek, process, and filter health information can help public health communicators better understand how their messages are received, analyzed, evaluated, and accepted or rejected.

We selected normative information management theory (Brashers, Goldsmith, & Hsieh, 2002; Brashers et al., 2000) and self-efficacy (Bandura, 1989) as our guiding theoretical and conceptual foundations. Normative information management theory (Brashers et al., 2002) suggests that individuals may seek to increase or decrease their uncertainty to serve emotional or informational goals. One way for people to manage uncertainty is by seeking or avoiding information. Therefore, we explore the types of information women search for and what they omit from their Internet searches.

Self-efficacy is identified as an important concept to consider in the design of public health campaigns (Ôunpuu, Woolcott, & Rossi, 1999; Rimal, 2001) and to understand how people use the Internet (Fredin, 1997). Self-efficacy is an individual's belief in his or her capacity to accomplish a task.

Bandura (1989) has suggested that self-efficacy is also related to how individuals manage distress. Bandura noted, "It is not the sheer frequency of stressful or intrusive cognitions but rather the perceived inefficacy to turn them off that is the major source of distress" (p. 730). Managing the distress of information may affect how women seek information on the Web. If women do not possess feelings of self-efficacy to engage in healthy behaviors, then they may avoid distressful information. Conversely, they may seek out information motivating them to engage in behavior change or behavior that makes them feel better about their current health and fitness practices.

We employed the think-aloud protocol analysis to explore these issues. This method is exploratory and provides data with abundant detail. Participant thoughts are recorded while they are engaged in Web searching, which allows a more accurate understanding of what people think than that offered by retrospective techniques.

The paper begins with a review of current studies of gender and the Internet. This is followed by an elaboration of the normative theory of information management and the concept of self-efficacy. We then explain the method used and outline the procedures we employed to analyze the data. Findings and a general discussion are presented at the end.

Literature Review

Internet Use and Gender

A recent survey by Datamonitor, a market research consulting firm, showed a 78% Internet market penetration in the United States (McKillen, 2002), and a Harris Interactive Poll suggests that 67% of U.S. adults are online ("Those with Internet," 2003).

The Pew Internet & American Life Project (Fox et al., 2000) found that over half of those with Internet access had sought health information. Of those who had, 13% looked for information on nutrition and fitness.

Studies of gender differences in Internet usage indicate that the gap has narrowed, with women's access equal to or greater than that of men. Ono and Zavodny (2003) conducted a secondary analysis of

five data sets from 1997 to 2001 and noted that while women appeared to be online more than men in 2001, men were likely to be online more often and for longer amounts of time.

Other investigations focus on the gender differences in attitudes toward technology and the type of content consumed. Studies have found that online culture and language have traditionally been male (Morahan-Martin, 1998), that U.S. females perceive a greater societal risk with the development of technology and science (Hornig, 1992), and that females use the Web more for e-mail and men read more information on the Internet (Jackson, Ervin, Gardner, & Schmitt, 2001). Jackson et al. (2001) argued that men have a "stronger motive for information," and that females have a stronger motive for "interpersonal communication" (¶ 37).

Feminist scholars have studied gendered identities online. Van Zoonen (2002) found young heterosexual couples to mutually shape each other into traditional Internet gender roles within the household, with the computer and Internet belonging in the male domain. Women were not passive users, however and were actively drawn to the Internet, "negotiating the former exclusively male codes of the PC" (Van Zoonen, 2002, p. 17).

Research also addresses information topics and gender. Morahan-Martin (1998) found that men tended to dominate most information-seeking topic categories except for health and travel. She attributed this to women's "traditional caretaker role" (p. 177). The Pew study (Fox et al., 2000) also illustrated that, of those with Internet access, women have looked at health information more than men (63% vs. 46%). In addition, the authors (Fox et al., 2000) found that although women sought health information for children more than men, "men and women were equally likely to be seeking information on behalf of a parent or other relative" (p. 6). Another study by Miller (2001) showed that women were more likely to seek health information on the Internet, while men sought more science-related information.

Internet use and the normative theory of information management

Use of the Internet is often considered a goal-directed activity whereby Internet users are active participants in their online experience (McKenna & Bargh, 2000). Similarly, when it comes to consumption of health information, Brashers et al. (2002) suggest that individuals have goals and manage

information for cognitive and emotional reasons. They suggest that "information seeking and avoiding may be a balancing act for individuals who need to achieve multiple goals (e.g., reducing uncertainty, improving or sustaining health, and maintaining optimism" (p. 261). Therefore, health information may serve instrumental or emotional goals.

The medical literature suggests a corresponding interpretation. A study of cancer patients found that they avoided information if it undermined their hope for improvement, but discovered patients may have sought more information if they believed alternative treatments could help them (Leydon, Boulton, Moynihan, Jones, Mossman, et al., 2000). In the same way, those seeking nutrition or fitness information may select that which will make them feel better about their behaviors and avoid distressful information. Information seeking may be limited to situations that accord individuals the self-efficacy to manage their health.

Although Brashers et al. (2002) largely focused their efforts on studying information management in interpersonal contexts (i.e., doctor-patient relationships, patient-family relationships) they also noted that information from the media and Internet can affect an individual's level of uncertainty and information balance. Brashers et al. (2002) suggested that individuals might encounter certain challenges to their online informational goals. They proposed that individuals may feel overwhelmed by the information, not know the origin of the information, and may lack the expertise to interpret it. The credibility of the information encountered or discovered on the Internet, and an individual's perceived self-efficacy to interpret and use that information, may pertain to whether an individual decides to use the information or to avoid it.

Source credibility has long been associated with involvement in message processing. For example, Petty and Cacioppo's elaboration likelihood model (1984) and Chaiken's heuristic systematic model (Chaiken, Liberman, & Eagly, 1989; Chaiken & Maheswaran, 1994) both suggest that individuals invoke information processing shortcuts to evaluate persuasive messages. A message from a high credibility source or that contains more persuasive arguments may lead to less message scrutiny for those with low involvement (Petty & Cacioppo, 1984).

Credibility is comprised of several variables (West, 1994). It has been measured by looking at ratings of believability, fairness, accuracy, thoroughness, comprehensiveness, and bias (Johnson & Kaye, 1998, 2000; Leshner, 2001). Johnson and Kaye (1998) defined credibility for online political information as "the degree to which politically-interested Web users judge information on the Internet to be believable, fair, accurate, and in depth" (p. 325). The credibility of the online sources may affect how women process and manage health information.

Aldoory (2001) used focus groups and situational theory to explore the antecedent variables associated with women's involvement in health messages. She found that, "In particular, source credibility and trust were critical to involvement with health information" (p. 177). The variables she studied were: "consciousness of everyday life," "self-identity," "source preference," "a consciousness of personal health," and "cognitive analysis of message content."

Krummel, Humphries, & Tessaro (2002) examined how factors influenced women's perceived self-efficacy to make nutritional behavior changes. They found that "Self-efficacy for behavior change varied and did not depend on age" (p. 41). The authors observed that the primary reasons for not adopting a healthful eating plan were family preferences for unhealthful foods, cost, time to prepare the food, limited knowledge about nutrition, and lack of support from family members and friends who invited them to eat. Factors that sparked change included emotional scares (when a doctor diagnoses them with a disease), how they thought about healthy eating, and knowledge about how to implement change.

In sum, women go online for health information, but we do not know where women go and how they process information they find. Normative information management theory informs us that individuals may use information to achieve emotional or informational goals and may be affected by self-efficacy factors. Research on self-efficacy suggests that the individuals' self-efficacy for using a computer, understanding information, and following healthful eating and fitness recommendations may be connected to how they balance and perceive information. Studies that explored involvement with

health messages suggest that credibility and personal relevance are important factors. The next section outlines our research questions.

Research Questions

Based on our review of the literature, we pose three research questions. First, although it is known that women search the Internet for health information, and that 13 percent of those who search the Internet search for nutrition and fitness information, we wanted to know where women will search when given a choice and how they will define a healthy lifestyle. Therefore, we pose the following research question:

> RQ1: When given a choice, where do women go on the Web to seek information about leading a "healthier" lifestyle and how do they define a healthier lifestyle?

According to normative information management theory, individuals manage the health information they receive for emotional and informational reasons. We wanted to assess whether women identify nutritional self-efficacy issues when searching for information, and whether women avoid information that might cause them distress. To this end, we pose a second research question:

> RQ2: How do women's thoughts about health information from the Web pertain to self-efficacy or information avoidance?

Aldoory (2001) identified multiple factors related to women's involvement with health messages. Our third research question relates to whether women think about these involvement factors while they search the Internet:

> RQ3: Can women's thoughts about health messages on the Web be categorized according to the involvement variables of source credibility, self-identity, and self-consciousness of health?

We used verbal reports, or think-aloud protocols, to collect the data. The second author transcribed the tapes and both authors then analyzed the 12 transcripts using a grounded theory method. Detail about the method is described in the next section.

Method

Protocol Analysis

The purpose for using think-aloud protocols is to examine cognitive processing while an individual is engaged in a task (concurrent), or immediately following the task (retrospective). According to Shapiro (1994) the basis behind the method is that, "As a person does a task, he or she can report relatively accurately on information passing through short-term memory (STM)" (p. 2).

The think-aloud technique is used in cognitive psychology, consumer research (Kuusela & Paul, 2000), education (Smagorinsky, 1989), media studies (Eveland & Dunwoody, 2000; Light, 1999; Tremayne & Dunwoody, 2001) and speech communication (Hample, 2000). Ericcson and Simon (1984) originally introduced this method of verbal reports to gather data on people's attitudes, opinions and thought patterns while individuals were conducting an activity or task. Automatic processing, such as schema activation or memory storage, is not recorded with this method. This is because, as Nisbett and Wilson (1977) explained, "there is almost no conscious awareness of perceptual or memorial processes" (p. 232).

Sample sizes for protocol studies generally range from 10 to 30 participants (Eveland & Dunwoody, 2000). The quantity of data gathered during a protocol session makes large samples difficult to analyze.

Sample

Twelve female Internet users were recruited in January - February 2003 through two advertisements placed in a local newspaper (circ. 19,200) and fliers placed at public places throughout the community such as grocery stores, health clubs, the public library and student health center in a Midwestern city.

Participants were selected through a screening process. All participants reported using the Internet in the past two weeks. They were selected so there would be an even split according to exercise habits (exercised three or more times a week vs. less than three times a week) and primary reliance on

television or newspapers for news information. Participants could not be students at the local University or under the age of 18.

The sample is not representative of the general population, but met quota requirements. The mean age of participants was 39.4 years old. Of the 12 participants, the average number of hours spent at home or during personal time at work on the Internet was 3.57 hours per week (not including time spent playing games or using e-mail). Six participants reported being employed full-time, one part-time and two self-employed. Three participants were unemployed at the time. The six participants who reported exercising regularly exercised an average of five days each week and rated their overall health as between good and excellent (M=4.17 on a 5-point scale). The participants who reported not exercising regularly exercised an average of 2.83 days each week and rated their overall health as fair to good (M=3.67 on a 5-point scale). Participants reported media Web sites as having health information that was more trustworthy, accurate and unbiased (M=3.17) than health information found on pharmaceutical company Web sites (M=2.25).

Equipment

A Macintosh computer with a 14" monitor, a mouse, keyboard, and network Internet connection was used for this study. Internet Explorer5 or Netscape was used depending on the participant's Web browser preference. Participants' voices were audio recorded through a microphone and the Web sites visited were video recorded by a television and VCR. An Averkey system and sound managing board connected the computer and recording equipment.

Pretests

Three volunteers participated in pretests. The first two pretests revealed that the Internet browsing time was too long. We reduced the time 5 minutes for the third pretester who reported 20 minutes was more than enough time to search the Web.

Procedure

Prior to conducting the study, human subjects permission was received from the University Human Subjects Committee at a large Midwestern University.

When participants arrived for the study, they were greeted and the purpose of the study was explained. Participants were warned that if they grew silent, they would be reminded, "Please don't forget to verbalize your thoughts aloud." Individual sessions took place in a university office and lasted about 45 minutes to one hour.

Participants engaged in three practice tasks for the think-aloud protocol to familiarize them with the procedure. After the practice sessions, participants were asked to pretend they had made a decision to adopt a healthier lifestyle. They were told to search the Web anywhere they chose for information about living healthier. Afterwards, participants filled out a questionnaire of online behavior and health practices and beliefs. To conclude the session, participants were debriefed, paid $20, and thanked for their participation. Transcripts of the audio portion of the videotapes and lists of Web sites visited were used for coding purposes.

Data Analysis

We determined where women chose to go on the Internet by viewing the History folder that was captured by the Web browser and by examining the transcripts for each participant. To answer the second two research questions, we analyzed the transcripts as texts or ethnographic field notes (Emerson, Fretz, & Shaw, 1995). Transcripts ranged from 6 to 13 double-spaced pages (M=10.1; Mdn=10). We began by identifying themes in the data according to previous literature and by identifying new ones using a grounded theory approach (Glaser & Strauss, 1967). After reading the transcripts and generating the categories, the authors again went through the transcripts and categorized the thoughts. A thought was categorized as a complete idea before taking a pause. From the thoughts, general themes were identified to address the research questions.

Results

To answer RQ1, we examined where women went online to seek information about leading "healthier" lifestyles. Those Web sites visited most frequently were WeightWatchers.com and WebMD.com (see Table 1). WeightWatchers.com is the informational Web site for the popular weight loss program. The site contains an explanation of the program, community message boards and chat,

success stories, news stories, recipes, products for purchase, and "eTools." WebMD.com describes itself as "the leader in providing services that help physicians, consumers, health providers and health plans navigate the complexity of the healthcare system." The Web site offers news stories, message boards, doctor and clinic searches and a variety of searchable medical and lifestyle health information. Participants did visit other commercial, government, and nonprofit Web sites (see Table 2).

Participants chose to use the Web portals netscape.com and yahoo.com and the search engine google.com most often to search for health information. Five participants searched using google.com, two participants each used netscape.com and yahoo.com.

The common search terms can be divided into five categories: fitness, nutrition, diseases, general health terms and general terms not specific to a health topic.

The following were fitness search terms: best exercise, methods of exercise, exercise, Pilates, yoga, hatha, swimming, fitness, cardio and walk. Nutrition search terms were: prepared meals, vitamins, diet, veganism, macrobiotic, anti veganism, nutrition, low carbohydrates sandwich, Atkins diet and broccoli recipes. Disease search terms were: cancer, diabetes type II, heart disease and obesity in America.

Sometimes general health terms were used, such as: weight loss, wellness, body mass, health, weight, weight management, women's health, healthy lifestyle, dermatology, women health, WeightWatchers, smoking cessation, mental health, health wellness, health alternative, Health Fitness Journal. Other general non-health terms included: women, 50 and over, female age 50, research, basic information, Oprah, living better and what is.

Participants chose to define healthier lifestyle primarily in terms of weight loss, disease prevention and mental health. Weight loss included searching for information on diet and fitness. Participants defined healthier lifestyle usually within the first few search terms used, such as Participant 5 who began her search with "The best way to get a healthier lifestyle, at least for me anyway, is to control my weight." Participant 11 elected to search for diabetes from the beginning because she stated, "I'd just like to know what preventative measures can be taken." Other participants preferred defining a healthier

lifestyle from a mental health perspective, such as Participant 4 who said "And I'm actually going to type in mental health because I think that's the most important place to start any sort of healthy lifestyle."

RQ2 addressed women's thoughts about self-efficacy and information avoidance. We found that thoughts about self-efficacy could be internal or external. Self-efficacy was defined as the perception that one could personally change her health. Internal thoughts about self-efficacy pertained to their abilities to process, use, and acquire knowledge; physically engage in exercise and control their behavior. External self-efficacy was associated with how women could control their environment. No matter the type of self-efficacy, at times participants felt they had sufficient self-efficacy, while they did not at others.

Participants expressed a lack of self-efficacy to attain knowledge from information provided by some Web sites. For instance, Participant 4, while viewing an article in the Dermatology Online Journal, said, "This is more, since it's a journal, it's a little more above my level. I don't know what any of those words mean, so I don't really feel the need to read that." This participant felt she was not able to understand the information and chose to move on to something she felt was easier.

Sometimes participants lacked the self-efficacy to enact the healthy behaviors they encountered. Participant 10 searched for information about Vegetarian diets and commented, "It'd be hard to eat all those vegetables." This participant questioned her self-efficacy to follow a diet that included eating a variety of vegetables and meat-substitutes.

Self-efficacy was linked to perceived or real physical limitations. For example, Participant 1 viewed Priscilla Patrick's yoga videos and commented, "She's like, already so limber I don't know how I could ever begin to imitate what she does." This participant questioned her physical ability.

Participant 2 was looking at an exercise plan from Prevention Magazine and said, "Hamstrings…There I don't think I can do that. I can't do squats, no way." In this case, the participant had knee problems and her physical limitations kept her from doing exercises that might aggravate her knees.

On the other hand, participants also expressed positive self-efficacy related to acquiring the knowledge necessary to live a healthier lifestyle. While searching for fitness information about Pilates,

Participant 1 commented, "Um, trying to find out where I can get more information on Pilates so I can learn it myself without going to an instructor." This participant felt she had the capacity to teach herself Pilates once she obtained the right information.

Other participants had sufficient self-efficacy to envision preparing nutritious meals or completing exercise programs. While looking at healthy recipes, Participant 5 said, "Looks fairly easy, looks like the kind of thing I could do at home without a recipe. Um, not bad for a serving of calories." Participant 5 believed she had the self-efficacy to accomplish this task because she saw it as "easy."

Participant 2, while reading about a fitness program said, "And I've done that before and I've lost weight." This participant felt she was capable of performing this activity and reaching the goal of losing weight.

Additionally, Participant 2 noted, " 'Reducing pounds...a pedometer' Yeah , that might be good to use it, because, it's something that's...what's the word I'm looking for? Tangible. Something you can feel, something you can see so that you can see progress," while reading a news article. She was evaluating whether she liked the fitness tool and would use it.

Thoughts about external self-efficacy involved thoughts about one's environment or living situation. For example, Participant 9 looked at exercise plans on Reebok.com and commented, "Well let's look under that because I have a treadmill, so let's look under the walking." This participant selected walking information because she owned a treadmill and could easily participate in that activity.

Other factors about individual's situations and surroundings prevented them from participating in healthy behaviors. For example, while viewing information about a wellness spa, Participant 8 commented, "That seems pretty interesting. But really, you need someone to baby-sit your children while you exercise." This participant viewed her responsibility to care for her children as affecting her ability to exercise.

Information avoidance occurred when participants had specific informational goals defined. Individuals metaphorically "donned blinders" and focused intensely on finding the information they

wanted, avoiding all other information. Others just avoided information if it did not interest them, arouse their curiosity, required purchase, threatened their "comfort zone," or took a lot of work.

Some participants avoided information that went outside their health boundaries and did not meet their "comfort zone." For example, Participant 6, while viewing an article about improving your sex life, left the article and commented, "Um, I don't really need that." Participant 10, while searching for information on macrobiotic diets, read the introduction of one Web site and commented. "This isn't going to help," and left the site. This participant wanted to know "what do they eat," and when she did not immediately find the answer, she avoided the information and left the site.

Lack of interest caused some to avoid information they found. Participant 6 was reading about treadmills on reebok.com and said, "'Hot spots: Walkers can suffer from overuse, injuries caused by doing a number of things.' Um, I'm going to skip over that. 'How to avoid injury.' I'm going to skip over that." The participant chose not to process this information.

Requests for payment by Web sites drove some participants away. For example, Participant 6 read an article about a vitamin supplement for sale and said "Why do you need to pay for someone to tell you about information you can easily get anywhere?" This participant was not interested in paying just because a product for sale sponsored it. Participant 5 left WeightWatchers.com when she clicked on a link that was only accessible to paying members. She commented "and they're not willing to give me anymore unless I pay," as she justified leaving the site entirely.

Some participants avoided information that seemed like a lot of work. Participant 1 viewed a Web site about yoga poses and evaluated them as not very "comfortable." She left the site shortly after commenting, "I don't like…I don't really know if this is what I want." The participant chose not to pursue this particular Web site because the yoga poses did not meet her interest or skill-level.

Generally, when individuals elected not to process information they weren't necessarily trying to maintain or avoid gaining information, the individuals rather felt that the information was not relevant to them, their goals or that they were not interested in it.

RQ3 pertained to whether women's thoughts about health messages included involvement variables such as source credibility, self-identity, and a personal consciousness of their health practices.

Source credibility was an important involvement variable. Name recognition served as an important credibility variable. If the participants had had experience with an organization or recognized a name from the media, they were more likely to ascribe credibility to it. Also, interpersonal communications were important "gatekeepers" or sources that lent credibility to organizations and celebrities.

Participants often evaluated health information based on whether they recognized the name of the author or site. For example, Participant 1 examined the credibility of workout videotapes and said, "some of them, I know people make them with...there are certain people who are name recognizable people that do Pilates tapes...then you know you're going to get a good tape."

If the women could not immediately identify the author, they sought further evidence. For example, after clicking on a site about becoming Vegan, Participant 10 commented, "OK, wow, this is personal research. Donna Maurer…OK, what else has she done?" This participant wanted to find out whether the author of the article was credible before processing the health information.

Participant 8 had been looking at information at a health clinic Web site. She was trying to determine the credibility of the doctor, but couldn't figure it out based on the information she encountered. After getting frustrated she stated, "All right, I'm going to look at something else. Because that's just too much work." The participant chose to not process any subsequent information because she could not make sense of it.

Sometimes the information source was judged by the quality of the health information. For example, Participant 5, when looking at healthy recipes said, "It has a lot of cheese in it and butter. So, that doesn't strike me as the best. '8.2 grams of fat.' That's worse than fried broccoli." This participant was analyzing the true nutritional value and benefit of the recipes she was reading to determine if it was a good source for health information.

Past experience with and organization or product was important for establishing credibility of information. For example, Participant 2 identified with a magazine that she subscribed to, "Oh, Prevention. I get Prevention. I should go on their Web site. I get their magazine. That's another one that helps."

Thinking about what to put into a Google.com search, Participant 5 said "Maybe I should be more specific and search for, Weight Watchers. It's a commercial site, but they do, in my experience, offer a little bit more practical information." In this instance, satisfactory past experience led to the attribution of credibility.

Other times, participants relied on opinions of friends and family. While reading a story on why it is important to drink eight glasses of water each day, Participant 12 said, "Oh, yeah, and I like that thing about 'Crystal Light' and all the flavored waters and people say they do that as a replacement. Well, that one guy said to me, 'You don't take a bath in Crystal Light, why would you drink it?'" These thoughts show that friends exert influence over how information gets processed.

Participant 4 used an interpersonal contact as reason for searching for information on diabetes, "I kind of get interested in this because one of my good friends is, he's diabetic and he's very involved with the American Diabetes Association." In this case her friend acted as a mediator between the participant and her search for information about a healthier lifestyle. Participant 5 chose to enter WeightWatchers.com based on an interpersonal recommendation, "I have a friend who just signed up for Weight Watchers online and she was hopeful it would be good for her. So I'll check it out too."

Sometimes participants decided not to look at information from unknown sources. For example, Participant 1 read a workout DVD description that included "a 10 minute in depth interview with Anna Cabin," and commented "Whoever the heck that is." This participant evaluated that DVD as less credible.

Overall source credibility depended on past experience with the information source or Web site. If sources were unknown to participants but they were still interested in the information, they searched for

other recognizable indicators of credibility. In sum, source credibility was associated with message acceptance and involvement and appeared to be mediated by interpersonal communication.

Self-identity was particularly important to involvement for those who viewed healthier lifestyles as disease prevention. Also, some individuals had family histories of heart disease or diabetes. For them, how they viewed their own health history affected what information they viewed. For example, Participant 11 started to search for diabetes information and noted, "The reason I looked on diabetes is there is a history of diabetes in my family." She knew she had a family history of diabetes and wanted to learn more about it.

Participant 9 determined she was overweight based on a WeightWatchers.com chart. She then took this information and began searching for fitness information with the comment, "Well, we know what I'm supposed to weigh. Let's look at maybe some sort of other exercise thing." This participant became involved after identifying herself as overweight.

Most of the identity thoughts related to being a woman, a vegetarian, a cook, a lover of french fries, or a treadmill owner.

Women's consciousness of their own physical health practices also affected how they sought health information. Participant 2 was looking at exercise programs on a Web site and said, "OK, I do these, but I don't do these in the morning. These are like the Richard Simmons tape. I do the lateral raise, I do the abs, I do the triceps...standing curl." She was comparing the workout on the Web page to her personal health habits and exercise routine.

Also, Participant 3 had just finished examining different yoga poses and said, "And I do yoga, and I sort of think that helps with your women's health."

Participant 7 searched for information about cancer causes and said, "It's more, that's what I think I did, when I lifted those heavy boxes, I used to rest them on my chest tissue... I think I damaged tissue..." This participant was analyzing her own current health condition compared to the information she was reading on the Web. Other thoughts reflected the current health status of the participants, such as "I'm not losing my hair," and past or current risky health behaviors, such as "I don't monitor myself like I

should." Other thoughts about personal health risks were "which I used to smoke," and "I don't go out into the sun."

Other thoughts pertained to participants' personal wishes and desires for their health. Participant 10 searched the Web for information about changing her diet and said, "I don't eat meat, I want to change from Vegetarian to Vegan, so..." This participant wanted to change her dietary behaviors and searched for information on how to go about meeting her goal.

Participant 7 looked for information about her condition of diabetes and said, "OK, this is what I need to watch are my carbs, cut down on my carbs." The participant wanted to find information on how she could better monitor her diet while living with her condition.

Curiosity also led to involvement—even though some of the participants didn't plan to act on the information. One participant noted, "I'm going to check that out even though I'm not going to do it." An interest in reading the personal stories of those who had improved their health also attracted the women in our study. For example, Participant 8 who said, "I wonder if they have any testimonials? I just want to hear people's stories."

Source credibility, self-identity, consciousness of one's health practices and curiosity all appeared to lead to involvement.

Discussion

This study examined where women go on the Internet to find information leading them to "healthier" lifestyles. Our results showed that among our group of participants, there was a preference for the big name Web sites, WebMD.com and WeightWatchers.com. This is not surprising as Webster and Lin (2002) discovered that Web sites may also be subject to the Pareto's Law—that the majority of the Web audience visits a small number of Web sites. Health Web sites may well fall under this rule. We also explored what search terms were used, and exercise and health were commonly found. When it came to leading a "healthier lifestyle," definitions typically were about weight loss, disease prevention, and mental health.

We also explored how women's thoughts pertained to self-efficacy and information avoidance in their Web searches. It did appear that women searched for information that would give them hope. This was similar to findings from Brashers et al. (2000) and Leydon et al (2000) who found that individuals wanted to manage uncertainty by discovering information that provided them with reasons for optimism. Women did tend to avoid information that did not pertain to their interests. This was not the same type of avoidance found in the aforementioned studies. This is because the study samples were quite different as Brashers et al. examined AIDS/HIV patients and Leydon studied cancer patients. Similarly, however, we found that if women felt low self-efficacy for accomplishing a behavior, they might avoid seeking further information.

More importantly, our findings suggest there are numerous kinds of self-efficacy for finding online information to lead a healthier lifestyle. Our participants identified internal and external types. Internal forms included: knowledge about nutrition and fitness, comfort with using the Internet, perceived and real physical ability, and self-control over eating behaviors. External self-efficacy pertained to their living environment, family, time and fitness equipment. Both of these forms of self-efficacy also appeared to have an emotional component attached to them.

Contrary to findings by Aldoory (2001), we did not find that "consciousness of everyday life" had a large influence on these women's thoughts. This is partly due to differences in operationalization and the methods used. We did find that credibility was important to the likelihood that women would process information. Recognition and experience with the Web site were key factors. Credibility served as a heuristic cue for evaluating the source expertise or trustworthiness. Interpersonal communication appeared to work as a mediating factor in message evaluation. Self-identity also led women to search for health information that pertained to their specific needs. Messages that addressed the self-identities of participants captured their attention.

It must be noted that our findings are exploratory and based on a quota sample. The volunteers were in their mid- to late-30s and from the Midwest. Findings from different sample populations may offer distinct results. In addition, the presence of the research administrator may have affected participant

willingness to express some thoughts. Notwithstanding, this study contributes valuable insight into the minds of women as they search the Web for health information. It provides the rich description not available through traditional survey techniques.

Our results suggest that future studies should account for the varieties of self-efficacy that operate when women process nutrition and fitness information on the Web. This research would allow public health officials to target campaigns at different levels of self-efficacy (high vs. low) by the different forms of self-efficacy (nutrition, fitness, knowledge, and environmental). More exploration might be done on the emotional dimensions associated with self-efficacy. Furthermore, our findings support the idea that interpersonal communication performs an important role in mediating information from media sources. It also may be that certain health topics lend themselves more to interpersonal mediation than others. This deserves further exploration.

References

Aldoory, L. (2001). Making health messages meaningful to women: Factors that influence involvement. Journal of Public Relations Research, 13, 163-185.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. Developmental Psychology, 25, 729-735.

Brashers, D. E., Goldsmith, D. J., Hsieh, E. (2002). Information seeking and avoiding in health contexts. Human Communication Research, 28, 258-271.

Brashers, D. E., Neidig, J. L., Haas, S. M., Dobbs, L. K., Cardillo, L. W., & Russell, J. A. (2000). Communication and the management of uncertainty: The case of persons living with HIV or AIDS. Communication Monographs, 67, 63-84.

Chaiken, S., Liberman, A., & Eagly, A.H. (1989). Heuristic and systematic information processing within and beyond persuasion context. In J. S. Uleman & J. A. Bargh (Eds.), Unintended Thought (pp. 212-252). New York: The Guilford Press.

Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: effects of source credibility, argument ambiguity, and task importance on attitude judgment. Journal of Personality and Social Psychology, 66, 460-473.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). Writing ethnographic fieldnotes. Chicago: The University of Chicago Press.

Ericsson, K. A., & Simon, H. A. (1984). Protocol analysis: Verbal reports as data. Cambridge, MA: The MIT Press.

Eveland, W. P., Jr., & Dunwoody, S. (2000). Examining information processing on the World Wide Web using think aloud protocols. Media Psychology, 2, 219-244.

Fox, S., Rainie, L, Horrigan, J., Lenhart, A., Spooner, T., Burke, M., Lewis, O., & Carter, C. (2000, November 26). The online health care revolution: How the Web helps Americans take better care of themselves. Retrieved from March 18, 2003, from http://www.pewinternet.org/.

Fredin, E. S. (1997). Rethinking the news story for the Internet: Hyperstory prototypes and a model of the user. Journalism & Mass Communication Monographs, 163, 1-47.

Glaser, B. G., & Strauss, A. L. (1967). The discovery of grounded theory: Strategies for qualitative research. Chicago: Aldine Publishing Co.

Hample, D. (2000). Cognitive editing of arguments and reasons for requests: Evidence from think-aloud protocols. Argumentation and Advocacy, 37, 98-108.

Hornig, S. (1992). Gender differences in responses to news about science and technology. Science, Technology, & Human Values, 17, 532-542.

Jackson, L. A., Ervin, K. S., Gardner, P. D., & Schmitt, N. (2001, March). Gender and the Internet: Women communicating and men searching. Sex Roles: A Journal of Research, 44, 363-379. Retrieved August 27, 2002, from Expanded Academic ASAP database.

Johnson, T. J., & Kaye, B. K. (1998). Cruising is believing?: Comparing Internet and traditional sources on media credibility measures. Journalism & Mass Communication Quarterly, 75, 325-340.

Johnson, T. J., & Kaye, B. K. (2000). Using is believing: The influence of reliance on the credibility of online political information among politically interested Internet users. Journalism & Mass Communication Quarterly, 77, 865-879.

Krummel, D. A., Humphries, D., & Tessaro, I. (2002). Focus groups on cardiovascular health in rural women: Implications for practice. Journal of Nutrition Behavior and Education, 34, 38-46.

Kuusela, H., & Paul, P. (2000). A comparison of concurrent and retrospective verbal protocol analysis. American Journal of Psychology, 113, 387-404.

Leshner, G. (2001). Critiquing the image: Testing image adwatches as journalistic reform. Communication Research, 28, 181-207.

Leydon, G. M., Boulton, M. Moynihan, C., Jones, A., Mossman, J., Boudioni, M., & McPherson, K. (2000). Faith, hope, and charity: An in-depth interview study of cancer patients' information needs and information-seeking behavior. Western Journal of Medicine, 173, 26-31.

Light, A. (1999). Fourteen users in search of a newspaper: The effect of expectation on online behaviour. [On-line]. Available: http://www.cogs.susx.ac.uk/users/annl/Expectations.htm.

McKenna, K. Y. A., & Bargh, J. A. (2000). Plan 9 from cyberspace: The implications of the Internet for personality and social psychology. Personality and Social Psychology Review, 4, 57-75.

McKillan, D. (2002). The IMPACT of Internet penetration. Medical Marketing and Media, 37, 12.

Miller, J. D. (2001). Who is using the Web for science and health information? Science Communication, 22, 256-273. Retrieved March 31, 2003 from OCLC FirstSearch database.

Morahan-Martin, J. (1998). Males, females, and the Internet. In J. Gackenbach (Ed.), Psychology and the Internet: Intrapersonal, interpersonal and transpersonal implications (pp. 169-197). San Diego: Academic Press.

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. Psychological Review, 84, 231-259.

Ôunpuu, S., Woolcott, D.M., & Rossi, S. R. (1999). Self-efficacy as an intermediate outcome variable in the transtheoretical model: Validation of a measurement model for applications to dietary fat reduction. Journal of Nutrition Education, 31, 16-22.

Petty, R. E., & Cacioppo, J. T. (1984). The effects of involvement on responses to argument quantity and quality: Central and peripheral routes to persuasion. Journal of Personality and Social Psychology, 46, 69-81.

Rimal, R. N. (2001). Perceived risk and self-efficacy as motivators: Understanding individuals' long-term use of health information. Journal of Communication, 51, 633-654.

Shapiro, M. A. (1994). Think-aloud and thought-list procedures in investigating mental processes. In. A. Lang (Ed.), Measuring psychological responses to media (pp. 1-14). Hillsdale, NJ: Lawrence Erlbaum.

Smagorninsky, P. (1989). The reliability and validity of protocol analysis. Written Communication, 6, 463-479.

"Those with Internet access to continue to grow, but at a slower rate," PR Newswire. Retrieved March 31, 2003, from Lexis-Nexis database.

van Zoonen, L. (2002). Gendering the Internet: Claims, controversies and cultures. European Journal of Communication, 17, (1), 5-23.

West, M. D. (1994). Validating a scale for the measurement of credibility. Journalism Quarterly, 71, 159-168.

Wetter, A. C., Goldberg, J. P., King, A. C., Sigman-Grant, M., Baer, R., Crayton, E., Devine, C., Drewnowski, A., Dunn, A., Johnson, G., Pronk, N., Saelens, B., Snyder, D., Walsh, K., and Warland, R. (2001). How and why do individuals make food and physical activity choices. Nutrition Reviews, 59 (3), S11-S20.

Table 1

Time Spent on Web Sites by Participant

Participant	Searching	WebMD	Weight Watchers	Most Time Spent
1	4:53			Google.com (4:53)
2			4:33	ivillage.com (13:36)
3	3:15		3:30	health.netscape.com (7:44)
4	5:04			search.netscape.com (5:04)
5	2:36		10:02	weightwatchers.com (10:02)
6	1:56			oprah.com (11:27)
7	5:14			about.com (7:16)
8	6:44	2:09		google.com (6:44)
9			10:56	weightwatchers.com (10:56)
10	5:11			healthywomen.org (5:37)
11	2:28	10:07		webmd.com (10:07)
12	6:19	3:36		gulfmd.com (6:36)

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Table 2

Female Participants Sites Visited

Participant #1: google.com stottpilates.com quakeroatmeal.com ageless.com healthandfitness.com health-fitjrnl.com personalhealthcare.com yogaone.com	**Participant #5:** weightloss-index.com google.com weightwatchers.com broccoli.com allrecipes.com	**Participant #9:** weightwatchers.com reebok.com health.com
Participant #2: ivillage.com weightwatchers.com prevention.com	**Participant #6:** google.com healthexpo.org oprah.com yahoo.com health.yahoo.com shopping.yahoo.com	**Participant #10:** vegan.org vrg.org www.google.com macrobioticcooking.com imss.macrobiotic.net mercola.com veganoutreach.org 4woman.gov healthywomen.org
Participant #3: netscape.com health.netscape.com allhealthy.com weightwatchers.com	**Participant #7:** digitaljayhawk.com diabetes.about.com nutrition.about.com search.msn.com howstuffworks.com	**Participant #11:** webmd.com health.msn.com
Participant #4: home.netscape.com search.netscape.com mentalhealth.org samhsa.gov quitnet.com lungusa.org families-first.com cdc.gov diabetes.org fda.gov dermatology.cdlib.org nutrition.org	**Participant #8:** microsoft.com google.com global-fitness.com edietstar.com wellness-fitness.com webmd.com momentum98.com goldberg.getwebspace.com	**Participant #12:** yahoo.com gulfmd.com webmd.com 2stepweightloss.com www.swanson.com

Environmental Hazards, Cancer Risk Judgments, and Media Use in Appalachia

Daniel Riffe
Professor
and
Presidential Research Scholar
E.W. Scripps School of Journalism
Ohio University
740-593-2597
riffe@ohio.edu

Paper presented at the Association for Education in Journalism and Mass Communication Annual Convention, Kansas City, July/August 2003. The research reported here was funded by the American Cancer Society.

Environmental Hazards, Cancer Risk Judgments,
and Media Use in Appalachia

This study examines cancer risk judgments among Appalachian Ohioans, exploring how concern about seriousness of local environmental health hazards is related to those judgments. It also explores how those judgments and beliefs are related to use of newspapers, television, and radio, and particularly to use of medical and health-related news.

Background:

According to the American Cancer Society, 1 in 210 Americans will develop some form of cancer this year and 1 in 478 will die of cancer (American Cancer Society: Ohio Division, 2002). Presenting these national statistics to illuminate the average American's likelihood or risk of cancer, however, represents a "judgmental heuristic" that may be alien to members of the public (Nathan, Heath, and Douglas, 1992). In other words, while experts believe statistical probability estimations can help people determine whether a level of risk is tolerable or unacceptable, such a statistical risk may have little to do with one's "risk judgment," or how a person evaluates particular hazards (Dunwoody and Neuwirth, 1991; Slovic, 1987).

Nathan, Heath, and Douglas note instead that "laypeople's risk ratings, unlike those of experts, are influenced not just by fatality estimates, but also by their judgments of several qualitative factors," including whether a threat, activity, or technology is "involuntary, unfamiliar, unknown, uncontrollable, controlled by others, unfair, memorable, dreaded, acute, focused in time and space, fatal, delayed, artificial, and undetectable, as well as if individual mitigation is impossible" (1992, 236-237). Indeed, some studies showing tolerance for environmental health risks also show that tolerance

has little to do with either factual knowledge or knowledge of formal statistical risk estimates (Baird, 1986).

In a study of how the seriousness of local environmental hazards impacts people's estimates of their risk from such hazards, Riffe and Knight (2002) have suggested that some tolerance for environmental hazards that people exhibited may be evidence of an "optimistic bias." According to Weinstein (1980, 806) it is common among people to exhibit biased optimism: to "expect others to be victims of misfortune, not themselves." This biased optimism does not reflect "merely a hopeful outlook on life, but an error in judgment."

Weinstein (1987) suggests several different processes that may be involved in biased optimism. First, it may represent "defensive denial" that helps people avoid anxiety about a threat to well-being. Second, people claim to be less at risk "to enhance or maintain their self-esteem," engaging in "downward comparisons" with people at high risk or overestimating their own "ability" at risk avoidance. Third, people commit "cognitive errors" because of the rarity of events or their own lack of experience with them, without recognizing that the events are equally rare for their peers. Fourth, people err by believing that lack of *previous* experience with an event also predicts its *future* unlikelihood.

The present study's focus is on how risk judgment about cancer might be related to beliefs about particular situational or contextual properties—i.e., the presence of dangerous, cancer-causing hazards in the local environment—and to use of news media, particularly news content (health and medical stories) created and disseminated ostensibly to aid in risk avoidance or reduction. The study builds on previous research

(Riffe and Knight, 2002) examining environmental hazards, risk judgments, and evaluations of media performance in reporting the environment.

Previous Studies:

In their survey of residents of poor Appalachian Ohio River valley counties that are "subject to a mix of environmental, health, and economic pressures," including hazardous waste sites, toxic chemical releases, and air emissions, Riffe and Knight (2002) did not examine cancer risk judgment specifically. Instead, they asked about the seriousness of threats posed by "environmental hazards" in general to the more general "quality of life," to "the health of most people," and "to your health personally."

While respondents demonstrated both risk awareness and biased optimism—73% saw "most people" threatened by environmental hazards but only 64% felt threatened themselves and only 51% worried they would develop health problems because of those hazards—risk judgment varied, depending on the extent to which 14 *specific* environmental hazards were judged to be "serious problems" locally ("where you live"). A scale summing the 14 items was then used to break the sample into groups reporting low, medium, and high numbers of serious hazards locally.

Perceived risk to "most people" and "to your health personally" did increase monotonically and significantly with number of serious local hazards (i.e., having more numerous serious hazards locally meant greater perceived health risk), but the gaps (the optimistic bias) between the estimates of risk for self and other disappeared for two of the three groups. Those in the middle-hazard group exhibited significant biased optimism, but those in the low- and high-hazard groups did not. In an effort to explain why those facing the *most* numerous serious hazards (the high-hazard group) did *not* exhibit an

optimistic bias, Riffe and Knight suggested that awareness of the sheer number of local hazards for the high group may lead to realistic resignation. Weinstein (1980) had, after all, found that people with experience with a problem, or who thought the problem particularly serious (both conditions could aptly describe the Riffe and Knight "high-hazard" group) were less optimistic about their own risk compared to others'.

In the same study, news media were evaluated more favorably as sources of environmental information than were government or businesses and companies in the area across all three problem levels. There was no significant association between evaluation of news media performance and number of serious local hazards.

Because their focus was the effect of those local hazards on risk judgment, Riffe and Knight did not examine the relationship of news media exposure to environmental risk judgment. However, studies have used exposure as an independent variable and examined its effect on risk judgment. Coleman (1993), for example, examined the influence of mass media and interpersonal communication on both personal and societal-level risk judgments about heart disease, AIDS, smoking, radioactive waste, contaminated water, radon, chemicals in foods, and household cleansers. Her mail survey of 671 New Yorkers revealed that mass media tended to affect not only societal-level risk judgments, a finding consistent with other research (Culbertson and Stempel, 1985), but also personal risk judgments, an unanticipated finding, based on previous research (Culbertson and Stempel, 1986; Dunwoody and Neuwirth, 1991). "Overall," Coleman wrote (p. 624), "information channels are not major players in the judgment picture."

The present study examines the relationship of news media use to cancer risk judgment. It does not, however, specify a causal direction. The assumption explored here is that cancer risk judgments and beliefs about the presence of cancer-related hazards may be *affected by* news coverage (particularly when news deals with health issues and with reports on medical research); alternatively, such coverage may be *consumed because* of existing concern. Coleman-Sillars and Slaughter (2000), noting that such news has "increasingly captured the attention of media," credit that attention to the "aging of the United States baby boomer population, the threat of HIV and AIDS, and reframing of policy agendas to encompass such issues as health and risk equity."

This assumption of a role for news media in making residents aware of local hazards is based admittedly in normative notions of news media serving as "watchdogs" over the environment, over those who endanger it, and over those entrusted to protect it and the public (Tichenor, Donohue, and Olien 1980; Olien, Donohue, and Tichenor 1995). But while Tichenor, Donohue, and Olien write that "the need to keep watch over distant governmental and corporate bodies is deeply instilled in journalistic tradition" (1980 115), another stereotype is of a "lapdog" press that protects the interests of groups having power and not the interests of the general public (Olien, Donohue, and Tichenor 1995, 305). In many areas, a single factory or plant may be the dominant economic player, and one cannot assume aggressive "watchdog" reporting of hazards associated with that player.

Research Questions:

Based on the research reviewed briefly above, three research questions were posed for this inquiry into environmental risk perception among Appalachian residents.

RQ1: What is the level of cancer risk judgment among Appalachian residents?
RQ2: How do Appalachian residents rate the seriousness of cancer-related environmental hazards where they live?
RQ3: How do cancer risk judgment and beliefs about cancer-related environmental hazards relate to consumption of news about health and medical research?

The Current Study:

Appalachia includes 29 Southeast Ohio counties. A 1999 study identified Appalachian Ohio counties as having the "deadly distinction" of the highest death rates in the state (The Associated Press, 1999). Poverty, unhealthy lifestyles, and lack of health care are contributing factors, while state and federal data consistently show high levels of air, land, and water pollution. Ohio electric power plants release more emissions to land, air, and water than any other state's (Clear the Air, 1998). Only three other states release more toxic industrial wastes (U.S. Environmental Protection Agency, 1998) and Ohio ranks eleventh in number of hazardous waste sites. Ohio environmental regulation spending ranks in the lowest quarter of states (Program for Environmental Policy and Planning Systems, 1995).

Although conditions have improved, much of Appalachian Southeast Ohio suffers the "realities of deprivation" identified in the 1960s (Isserman, 1996). This study focuses on 13 Appalachian Ohio counties in the southeast part of the state, nine of which are classed as "distressed" by government assessment.[1] Most are in or near the Ohio River valley and face environmental, health, and economic pressures, including such "dirty" industries as mining and chemical and petrochemical refining. Median household income for the counties is $8,000 below the state average, and they average 17.5% of their population below the poverty level, compared to 11% for the state (U.S. Census Bureau, 2001). According to the Environmental Defense Fund's "scorecard," cancer risk among

some residents of these counties is 100 times greater than goals set with the Clean Air Act, and as many as 12% of houses have a high risk of lead hazards (Environmental Defense, 2002). A recent news story noted that coke-plant benzene releases in one of the counties are so intense that exposure will lead to cancer for 1 in 500 exposed, while benzene exposure-related cancer is a 1 in 100,000 likelihood nationally.

The research was conducted as part of a survey for the American Cancer Society's Ohio Division. In July 2002, trained interviewers using CATI equipment phoned 3,470 randomly selected numbers purchased from a commercial firm and proportional to the 13 counties. Nearly 2,000 were non-working, were answering machines, were business numbers, or were not answered. Of 1,435 calls that yielded a connection, 523 (36%) were completed. A conservative estimate of sampling error associated with a sample of 523 is +/- 4.3 % at the 95% confidence level. Interviewees were asked several questions about cancer risk and about 11 environmental hazards specifically (Ohio Environmental Protection Agency, 1995), and about their media use. Demographic data were also collected.

Findings:

Because of this study's focus on risk judgment, 54 respondents who had been diagnosed with cancer were excluded from the analysis, leaving a final sample of 469 respondents. Females were overrepresented in the sample at 61%. Respondents ranged in age from 18 to 92, with mean age 46.2 years. One in ten reported household income below $10,000 annually, a third reported income below $25,000, 58% were below $40,000, and 18% reported earning more than $60,000.

RQ1 asked "What is the level of cancer risk judgment among Appalachian residents?" Measures designed to answer that question ranged from general questions about cancer risk, to assessment using a 10-point metric, as shown in Table 1. More than half (55%) of the respondents indicated they believe cancer can be prevented and more than half (56%) reported being at least "somewhat" afraid of developing cancer. Asked to quantify the risk of cancer "for people where you live" on a 1-10 scale (1="no risk" and 10="extremely high risk"), the average rating was 6.33, though 82% rated others' risk at 5 or above and 10% gave ratings of 10.

By comparison, the mean cancer risk—using the same 1-10 scale—for respondents themselves was only 4.96. Two-thirds, in fact, reported their own risk at 5 or below, with 8% claiming "no risk" but 5% reporting they themselves were at "extremely high risk." In fact, when average rating for "your own risk" (4.96) is subtracted from the average rating "for people where you live" (6.33), the difference of 1.37 indicates the extent of biased optimism. A paired-samples t-test showed the mean scores were significantly different ($t=10.23$, 468 d.f., $p<.0001$).

To answer **RQ2** ("How do Appalachian residents rate the seriousness of cancer-related environmental hazards where they live?"), respondents were asked to indicate the seriousness of eleven environmental hazards often associated with cancer "in the area where you live." The hazards (listed in Table 2) were derived from a study by the Ohio Environmental Protection Agency (1995).

While some might question inclusion of "declining water quality" and "unacceptable air quality" in the list, two late spring 2002 events likely made these hazards particularly salient in Appalachian Ohio. In April, Ohio River valley residents

sued DuPont for the second time for dumping C-8, a chemical used in making non-stick finishes and linked to laboratory animal cancers, into the Ohio and tributary rivers and releasing it into the air; a DuPont spokesperson dismissed the complaint as groundless, because the company had been using C-8 for 50 years, far longer than specified in the suit! Two weeks later, American Electric Power agreed to buy *an entire town* for $20 million in order to relocate residents who had claimed for years that sulfuric smoke from a nearby coal-fueled AEP plant and the acidic haze and other irritants it precipitated were a health hazard.

Each hazard offered to respondents could be rated "Not Serious At All," "Not Very Serious," "Somewhat Serious," and "Very Serious." Table 2 presents the hazards in order of seriousness, based on combined "Somewhat Serious" and "Very Serious" responses. Seven of the eleven hazards were rated as serious local problems by at least half of those responding. As Riffe and Knight (2002) concluded, the primacy of water quality, handling dangerous materials at work, air pollution, and improper disposal and dumping of chemicals are "familiar and recurring problems" in Appalachian counties "characterized by mining, chemical, and petrochemical operations—all notoriously 'dirty.'" The eleven items exhibited satisfactory internal reliability (Cronbach's alpha=.86) and were subsequently summed to create the scale reported below.

First, however, Table 3 reports descriptive data on use of television, radio, and newspapers. For each medium, respondents reported weekly frequency of viewing, listening to, or reading "the news," "health-related news stories," and "news stories about medical research." Response options were "Never," Less than Once a Week," "Once a Week," "Several Times a Week," and "Daily." While these arguably represent only

ordinal categories, they were were tested against an algorithmic transformation and used in statistical analyses;[2] Coleman (1993) reported factor and regression analyses with similar media use measures.

Generally speaking, the survey respondents were more oriented toward television news than to radio or newspapers: 80% reported watching television news several times a week or daily, compared to 49% for radio news and 58% for newspapers. One in five (22%) never reads a newspaper and 34% never listen to radio news. Television enjoys similar "dominance" in terms of health-related stories and medical research stories: 51% report viewing health-related stories several times a week or daily, compared to 18% for radio and 32% for newspapers; numbers for medical research stories are 44%, 15%, and 29% respectively.

Table 4 presents zero-order correlations (Pearson's r) among several measures, including those designed to answer **RQ3** ("How do cancer risk judgment and beliefs about cancer-related environmental hazards relate to consumption of news about health and medical research?"). First, though, some measures were transformed. An overall local environmental cancer hazards score was created from the 11 items reported in Table 2. Responses of "Not at all Serious" and "Not Very Serious" to each of the 11 hazards were recoded as zero, and "Somewhat Serious" and "Very Serious" recoded as 1. Recoded scores across all 11 hazards were summed, yielding an overall environmental hazards score ranging from 0 to 11 (Mean=5.42, sd=3.2).

"Own" and "Others'" cancer risk scores were the original 1-10 ratings from Table 1, with Optimistic Bias the difference between those two. Belief that cancer is preventable was recoded as a dichotomous or dummy variable (no or not sure=0; 1=yes),

as was gender (1=male), education (1=beyond high school graduate), income (1=above $40,000 annual household income), and whether one is a daily smoker (1=yes).

Table 4 shows that the number of serious local hazards is significantly correlated with use of all three media for health-related and medical research stories, but not general consumption of the three, thus providing a partial answer for **RQ3.** Again, one might ask whether salience of hazards prompts information-seeking, or if use of health-related and medical research stories makes people aware of hazards. Of course, reported number of hazards is also significantly correlated with education, itself typically associated with news media consumption. Yet use of these types of specialized news was not, with a few exceptions, correlated significantly with personal risk rating, others' risk rating, or the resulting measure of biased optimism.

Meanwhile, number of serious local hazards reported is significantly correlated with cancer risk judgments, both for oneself and for others (and, therefore, with biased optimism). Put simply, one's estimate of cancer risk—and the risk to others who live there, too—is related to the presence of serious hazards.

Other Table 4 correlations show that one's own perceived cancer risk is correlated negatively and significantly with age. Older respondents rate their risk of cancer as lower. Recall Weinstein's (1987) "cognitive errors": people's personal lack of experience with a life event may lead to optimism, without their recognizing such events are equally rare for their peers, and to the belief that lack of previous experience with cancer predicts its unlikelihood of *ever* occurring.

Others' cancer risk rating is significantly correlated with education and belief that cancer is preventable. Some of the strongest correlations, not surprisingly, involved

smoking. Smoking is significantly correlated with one's own risk rating, but negatively with others' risk and with biased optimism. Finally, because of its correlation with both the personal risk measure and the measure of risk to others, the summary biased optimism measure is also associated with belief in preventability, with education level, and with medical research reading.

Table 5 also addresses **RQ3** about relationships of environmental hazards, risk judgments, and media use, but employs t-tests and analyses of variance in lieu of the zero-order correlations of Table 4. First, however, the summed (0-11) environmental hazard score was again transformed to identify three levels of local cancer-related hazards, as in Riffe and Knight's study (2002). The summed score, with a range of 0-11 and mean of 5.4, was collapsed to form a Low Hazard group (0-3 hazards), Medium Hazard group (4-7 hazards), and High Hazard group (8-11 hazards), containing 31%, 41%, and 28% of respondents, respectively.

The three hazard levels were used as grouping variables in a oneway analysis of variance which showed monotonic increases in ratings of others' cancer risk as hazard level increased (e.g., 5.59 to 6.39 to 7.03) and that yielded a significant F (12.30, [2,460], p=.001). Post hoc analysis (least significant differences) showed all three levels were significantly different from one another (p=.05).

Similar analysis showed a significant F for one's own cancer risk (3.61, [2,460], p=.03), with the Low Hazard group (4.52) significantly different by post hoc test from both the Medium (5.14) and High Hazard group (5.18); the latter two groups, somewhat surprisingly, did not differ significantly from one another. That is, those in the Medium and High Hazard groups did not differ in rating their own cancer risk.

Note, however, the monotonic increase nonetheless in magnitude of self-other risk difference (optimistic bias) across levels (1.08, 1.26, and 1.85), made apparent by the pairwise-samples t-test *within* each level. As number of local hazards increased, the size of the difference between one's own risk and others' increased. Given that Medium (5.14) and High (5.18) Hazard respondents did not differ appreciably in their own risk rating, this increase in optimistic bias is telling: more local hazards does lead to greater optimistic bias, primarily through elevated rating of others' risk. Increasingly larger numbers of hazards, it seems, pose more of a threat to one's neighbors than to oneself.

Finally, Table 5 also examines the nine media use behaviors, controlling for hazard level. As in Table 4, hazard level is not appreciably associated with general use of television, radio, or print news. However, for both types of specialized news (health-related and medical research stories), use increases significantly and monotonically with higher hazard levels. The effect of hazard level is made clearest with the post hoc analysis (i.e., superscripts) that shows that the High Hazard group means for specialized use are significantly different from both lower-hazard groups.

Of course, calling this an "effect" and inferring a causal direction is risky: those who consume most may develop a greater awareness of hazards. Or presence of a greater number of hazards may prompt information-seeking and consumption of relevant news stories.

Discussion and Conclusions:

This study has several limitations. It is geographically limited to a single region of Appalachia, albeit one known for "familiar and recurring" environmental problems. As often happens, the telephone survey overrepresented women. On the other hand, the

study's geographic "narrowness" constitutes a strength, simply because the region is rife with waterways polluted by dumping and mine acid runoff, with high-emission coal-burning power plants, with "dirty" industries whose workers must handle chemicals and even radioactive materials, with benzene-belching coke plants, and with brownfields—abandoned and polluted industrial sites that continue to leach into wells and aquifers.

The objective of the study, after all, was to assess awareness of these kinds of hazards and examine their relationship to risk judgment about cancer.

Riffe and Knight (2002), in their study of environmental hazards and perceived health risks from those hazards, suggested that some of people's "tolerance" for hazards reflects biased optimism, the relative overestimation of others' likelihood of suffering negative events compared to underestimation of one's own likelihood. They showed, in a concrete way, that biased optimism does not exist in a vacuum—it can be viewed as more than a general reaction to abstract threats "for society." It can be related to the existence, number and severity of hazards where one lives, up to a point.

In essence, they illustrated how risk judgment is "reality-based." Like the resonance phenomenon in cultivation theory, those who are "objectively" more at risk—in terms of number and severity of real, local hazards—judge themselves to be more at risk. They may cope with or tolerate those hazards, however, by defensive denial and unrealistic optimism, overestimating their risk avoidance skills or making what Weinstein (1980) called "an error in judgment" about others' risk. The process seemed linear, up to a point. Yet Riffe and Knight's (2002) respondents who were objectively *most* at risk did not exhibit biased optimism.

Focusing on cancer risk judgment and presence of local environmental hazards that have been linked to cancer, this study found similar results. It certainly confirmed the existence of biased optimism. Eight of ten people surveyed believed others who live where they live are at risk of cancer, with far fewer acknowledging a similar level of risk for themselves. Both of these risk estimations were also somewhat "reality-based" as well, varying by number of serious local hazards. As the level of hazards increased, ratings of others' risk increased. Self-risk rating increased as well, but only up to a point, where it reached a threshhold (recall the similar self-rating for the Middle and High Hazard groups). The risk "gap" (or optimistic bias) continued to increase but only because at the highest level of hazards, respondents gave far higher ratings to others' risks, without a "matching" increase in their own self-risk ratings.

This threshhold effect among these subjects may illuminate an important aspect of the psychology of optimistic bias, the "defensive denial" Weinstein described (1987). At lower levels of objective risk (i.e., fewer hazards), they were able to realize—and reflect in their self-ratings—that they were indeed at some risk. Yet they estimated others' risk as higher—even though they were asked about neighbors and friends "who live where you do." But when objective risk—the number of serious local hazards—becomes highest, they in effect denied that their own risk continued to climb; instead they "froze" their personal risk level while ascribing even greater risk to others.

How did hazard level and cancer risk judgment relate to media use? Again, the inferred directionality in the relationship is tentative, but hazard level for these subjects was associated with some specialized information consumption. The study found heavy reliance on television, compared to radio or newspapers, in terms of general news

consumption and health-related and medical research stories. The number of serious local hazards was related to use of all three media for health-related and medical research stories, but not general consumption. However, to paraphrase Coleman (1993), zero-order correlations showed that media use measures were, generally, "not major players" in predicting cancer risk judgment or biased optimism, and vice versa.

Future analyses, using measures that assess how well such stories address particular environmental hazards and what people learn from them, may be better able to determine how this specialized media use fits into the knowledge and risk judgment sequence. Whether use of health, medical research, and science news assuages fear, contributes to or results from it, or simply raises awareness of the objective hazards where one lives, remains an important question.

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[1] Respondents were from Athens, Gallia, Jackson, Lawrence, Meigs, Monroe, Morgan, Noble, Pike, Ross, Scioto, Vinton and Washington counties.

[2] The data were collected as ordinal response options as part of a sponsored study. To test the measures for treatment as quasi-interval, the ordinal options were used to generate modified versions of each measure which were then correlated against the original options. Specifically, responses were recoded from numbers representing "never," "less than once," "once," "several times," and "daily," to 0, 0, 1, 3.5, and 7 respectively. The modified versions were then correlated (Pearson's r) with the original ordinal scales, with the resulting nine coefficients ranging from .90 to .98, with six above .93. This was judged acceptable, and the original scores were used in the computation of means and in other analyses.

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References

The American Cancer Society: Ohio Division. 2002. *Ohio Cancer Facts & Figures: 2002.* Dublin, OH: American Cancer Society.

The Associated Press. 1999. Appalachian area has deadly distinction. *The Athens Messenger,* 7 September, 1.

Baird, B. 1986. Tolerance for environmental health risks: The influence of knowledge, benefits, voluntariness and environmental attitudes. *Risk Analysis* 6:425-435.

Clear the Air. 1998. *State rankings for electric power plant emissions*. Washington, D.C.: Clear the Air. Available on the World Wide Web: http://www.cleartheair.org.

Coleman, C. 1993. The influence of mass media and interpersonal communication on societal and personal risk judgments. *Communication Research* 20:611-628.

Coleman-Sillars, C., and Slaughter, E. 2000. The influence of mass media and interpersonal channels on white and nonwhite men's and women's health behaviors. Paper presented at the Association for Education in Journalism and Mass Communication convention, Science Communication Interest Group, Phoenix, AZ.

Culbertson, H.M., and G. H. Stempel III. 1985. "Media malaise": Explaining personal optimism and societal pessimism about health care. *Journal of Communication* 35:180-190.

Dunwoody, S., and Neuwirth, K. 1991. Coming to terms with the impact of communication on scientific and technological risk judgments. In *Communicating issues of science, risk, and public policy* edited by L. Wilkins and P. Patterson, 11-30. New York: Greenwood.

Environmental Defense. 2002. Scorecard. New York: Environmental Defense. Available on the World Wide Web: http://www.environmentaldefense.org and http://www.scorecard.org.

Isserman, A. M. 1996. Appalachia then and now: An update of "the realities of deprivation" reported to the president in 1964. *Socioeconomic Review of Appalachia*. Washington, D.C.: Appalachian Regional Commission. Available on the World Wide Web: http://www.arc.gov/index.do?nodeId=1291.

Nathan, K., R.L. Heath, and W. Douglas. 1992. Tolerance for potential environmental health risks: The influence of knowledge, benefits, control, involvement, and uncertainty. *Journal of Public Relations Research* 4:235-258.

Ohio Environmental Protection Agency. 1995. *Ohio State of the Environment Report* Columbus, OH: Ohio Environmental Protection Agency.

Olien, C. N., G. A. Donohue, and P. J. Tichenor. 1995. Conflict, consensus, and public opinion. In *Public Opinion and the Communication of Consent*, edited by T. L. Glasser and C. T. Salmon. New York: Guilford Press.

Program for Environmental Policy and Planning Systems. 1995. *State environmental goals and indicators project: Ohio environmental statistics and indicators.* Tallahassee, FL: U.S. Environmental Protection Agency and the Florida Center for Public Management. Available on the World Wide Web: http://www.pepps.fsu.edu/segip/states/OH/stats.html.

Riffe, D., and Knight, J.E. 2002. Environmental threats, information sources and optimistic bias: Environmental risk in Appalachia. Paper presented at the Association for Education in Journalism and Mass Communication convention, Science Communication Interest Group, Miami, FL.

Slovic, P. 1987. Perception of risk. *Science* 236:280-285.

Tichenor, P.J., G. A. Donohue, and C. Olien. 1980. *Community Conflict and the Press.* Beverly Hills, CA.: Sage.

U.S. Census Bureau. 2001. Quickfacts. Washington, D.C.: U.S. Census Bureau. Available on the World Wide Web: http://quickfacts.census.gov/qfd/states/39/39009.html.

U.S. Environmental Protection Agency. 1998. *Toxic release inventory: Ohio.* Washington, D.C: U.S. Environmental Protection Agency. Available on the World Wide Web: http://www.epa.gov/tri/tri99/state/Ohio.pdf.

Weinstein, N.D. 1980. Unrealistic optimism about future life events. *Journal of Personality and Social Psychology* 39: 806-820.

----------. 1987. Unrealistic optimism about susceptibility to health problems: Conclusions from a community-wide sample. *Journal of Behavioral Medicine* 10:481-500.

Table 1: Judgment of Personal Cancer Risk and Risk to Others
(n=469)

Do you believe cancer can be prevented?		%		
	Yes	55		
	No	32		
	Don't know	13		
How afraid are you of getting cancer?				
	Very	16		
	Somewhat	40		
	Not at all	44		
On a scale of 1 to 10, with 1 being no risk and 10 extremely high risk, how would you rate the risk of getting cancer for people where you live?		mean	s.d.	n
		6.33	2.44	469
On a scale of 1 to 10, where 1 indicates no risk and 10 indicates extremely high risk, how would you rate your own risk of getting cancer?		4.96	2.37	469
"Optimistic bias" or difference between means:		1.37	2.89	469

$t = 10.23$, 468 d.f., $p < .0001$

Table 2: Environmental Hazards
(n=469)

How much of a problem is each one of these in the area where you live:	Percentage Identifying as Serious[1] %
Declining water quality in lakes, rivers and streams	72
People having to work with dangerous materials as part of their jobs	68
Unacceptable outdoor air quality because of pollution	60
Improper disposal or dumping of industrial or factory chemicals	55
Declining quality of water in underground wells	54
Unacceptable quality of drinking water	52
Accidental spills or leaks of chemicals	50
Abandoned industrial sites	37
Improper disposal of nuclear waste	32
Exposure to lead	31
Indoor air quality problems because of asbestos or radon	30

[1] Combines "Somewhat Serious" and "Very Serious" responses. Other options were "Not Very Serious" and "Not Serious at All."

Table 3: General and Health-related Media Use
(n=469)

Weekly viewing of:

	television news: %	health-related news: %	medical research news: %
Never	13	18	18
Less than once	2	15	19
Once	5	16	19
Several times	23	28	29
Daily	57	23	15

Weekly listening to:

	radio news: %	health-related news: %	medical research news: %
Never	34	38	39
Less than once	12	32	33
Once	5	12	13
Several times	16	12	11
Daily	33	6	4

Weekly reading of:

	news-papers: %	health-related news: %	medical research news: %
Never	22	25	26
Less than once	5	28	31
Once	14	16	15
Several times	17	20	19
Daily	41	12	10

Table 4: Zero-order Correlations (Pearson's r) among Risk Judgments, Cancer-related Beliefs and Behaviors, Environmental Hazards, and Media Use (n=469)

	Environmental Hazards	Own Risk	Others' Risk	Optimistic Bias
Cancer preventable	09	-01	14**	12**
Age	-09	-15**	-04	09
Gender	03	01	-05	-05
Education	15**	00	16**	13**
Income	08	00	07	06
Daily smoker	02	24**	-10*	-27**
Environmental hazards	--	12*	.25**	11*
Viewing of:				
television news	07	00	02	02
health-related news	16*	06	03	-02
med. research news	15*	07	11*	04
Listening to:				
radio news	05	06	07	01
health-related news	12**	02	08	05
med. research news	14**	04	07	02
Reading of:				
newspapers	06	02	07	04
health-related news	13**	00	09	07
med. research news	19**	-01	12**	11*

* Correlation is significant at the .05 level (two-tailed).
** Correlation is significant at the .01 level (two-tailed).

Table 5: Risk Judgments, Optimistic Bias and Media Use,
Controlling Level of Environmental Hazards

	Hazard Level:[1] Low	Medium	High	
Total risks:	0-3	4-7	8-11	
(*n*=)	(143)	(192)	(128)	**F, p**
mean scores:				
Others' risk of developing cancer (1-10) scale.	$5.59^{a,b}$	$6.39^{a,c}$	$7.03^{b,c}$	12.30, **.001**
"Your own" risk of developng cancer	$4.52^{a,b}$	5.14^{a}	5.18^{b}	3.61, **.03**
paired *t* =	*4.24*	*6.30*	*7.43*	
(d.f.)	*(142)*	*(191)*	*(127)*	
p =	***.001***	***.001***	***.001***	
Optimistic bias (others' risk – "your own")	1.08	1.26	1.85	2.68, .07
Weekly media use:				
mean scores:				
Viewing television news	3.01	2.98	3.27	1.83, .16
health-related	2.04^{a}	2.13^{b}	$2.64^{a,b}$	7.25, **.001**
medical research	1.87^{a}	1.97^{b}	$2.35^{a,b}$	4.97, **.007**
Listening to radio news	1.97	1.94	2.23	1.21, .30
health-related	1.06^{a}	1.11^{b}	$1.41^{a,b}$	3.23, **.04**
medical research	$.92^{a}$	1.04^{b}	$1.36^{a,b}$	5.24, **.006**
Reading daily newspaper	2.39	2.47	2.66	.98, .37
health-related	1.52^{a}	1.54^{b}	$1.98^{a,b}$	5.09, **.007**
medical research	$1.24^{a,b}$	$1.55^{a,c}$	$1.94^{b,c}$	9.90, **.001**

Means sharing a common superscript (*a, b,* or *c)* are significantly different (horizontally) by the Least Significant Differences post hoc test, at the .05 level.

[1] Per text discussion, these three levels of hazards are based on summed scoring for 11 items (alpha = .86) for each respondent. Scoring on each of the original items was 0 if the hazard was rated not very serious or not serious at all, and 1 if the hazard was rated somewhat or very serious. Scoring thus ranged from 0 to 11, with a mean of 5.4 and a standard deviation of 3.2.

New York Times and National Magazine Coverage of Project Chariot, 1958 to 1962

Ron Rodgers
Ph.D. Student
E.W. Scripps School of Journalism
Athens, OH 45701
Office: (740) 593-2471
Home: (740) 698-0292
e-mail: rr194602@ohio.edu
FAX: (740) 593-2592

Paper Submitted to the Science Communication Interest Group
of the Association for Education in Journalism and Mass Communication
2003 Convention
July 31-Aug. 2, 2003
Kansas City, Missouri

Abstract:
New York Times and National Magazine Coverage of Project Chariot, 1958 to 1962

This study reviews The New York Times' and magazine coverage from 1958 to 1962 of Project Chariot – an Atomic Energy Commission plan to blast out a harbor in northwest Alaska with four nuclear bombs. And in doing so, this study traces the four-year debate among scientists, government agencies and environmental activists that was largely played out in the media and ultimately led to the first stirrings of the modern environmental movement in the United States.

INTRODUCTION

If anyone wants a hole in the ground, nuclear explosions can make big holes.
– Edward Teller[1]

In the summer of 1958, three Inupiat Eskimo caribou hunters landed their small boat near the mouth of Ogotoruk Creek at Cape Thompson, an unpopulated region about thirty-one miles southeast of their village of Point Hope on Alaska's northwest coast and about 175 miles across the Chukchi Sea from the Soviet Union. There, they met several white men surveying the area. The surveyors informed the hunters that they were conducting geologic research for the U.S. Atomic Energy Commission.[2] As those hunters would learn later, the Atomic Energy Commission (AEC) and one of its contractors, the Lawrence Radiation Laboratory in Livermore, California, were proposing to explode four atomic bombs at the mouth of the creek near Cape Thompson to blast out a deepwater port that the AEC said could be used to ship coal, oil, and other resources.[3]

But even if they had known of these plans, the hunters probably would not have understood the significance of the survey – the surveyors' presence on that isolated stretch of land was one of the first public acts in what would turn into a nearly four-year debate among scientists, government agencies, and environmental activists that would largely be played out in the media. In addition, they certainly would have been unaware that the ensuing controversy and demand for accountability by those in government would lead to the first stirrings of the modern environmental movement in the United States.

This study will trace the print media coverage of these proposed atomic blasts from the first fairly neutral and largely one-sided (the AEC's) stories to the later and fuller reports revealing the risk of damage to the ecosystem, especially the food chain from lichen to caribou to the Eskimos. This study will explore how a handful of environmental activists working with scientific experts helped frame the later news coverage that eventually killed Project Chariot because of what one reporter called "adverse publicity about its effects on Alaskan Eskimos and their hunting grounds."[4]

This study will examine the coverage in *The New York Times* of Project Chariot from its announcement in 1958 to its cancellation in 1962 because it is the major newspaper of record in the United States and because it covered this project from its very first hint to its demise. In addition, it is the well-accepted source of information for government officials, who, in this case, were the final arbiters on whether the blasts in Alaska would proceed. This study also will look at Project Chariot's coverage in national magazines that wrote about the project during the same four-year period. They are: *Newsweek, Popular Mechanics, Popular Science, Science Digest, Scientific American, Science, Science News Letter, The Reader's Digest,* and *Harpers*. Coverage over the four years by these magazines was fairly limited and sporadic, but in the debate and controversy that swirled around Project Chariot, they were at times the conduit for the voice of one side or the other. But more importantly, magazine coverage of the effect on the food chain preceded *The New York Times*'s coverage, which then picked up the ball and wrote stories about the possible risk of, and its one editorial, about Project Chariot.

BACKGROUND

Renowned physicist Edward Teller, known as the "father of the hydrogen bomb" and at the time the head of the Lawrence Radiation Laboratory, proposed blasting out the harbor in a remote area of Alaska as a test of using atomic weapons for peaceful purposes.[5] In a book that he would publish four years later around the time of the project's demise, he described the scope of the project and the cost benefits of using nuclear blasts to carve out the harbor:

> The harbor basin and the canal connecting it to the ocean would cost less than 10 million dollars. Only four nuclear explosions, each with a yield of twenty kilotons would be needed to dig a deep water canal with a width of 250 to 300 yards. A turnaround harbor basin 600 yards in diameter could be dug at the end of the canal with a 200 kiloton nuclear explosion.[6]

The AEC explored other possibilities, but on June 9, 1958, it accepted Teller's proposal and dubbed it Project Chariot.

Chariot was the first project announced as part of Project Plowshare, which had its beginnings on September 19, 1957, when a small atomic bomb with the force of 1,700 tons of TNT went off below a mesa near Las Vegas known as Mount Rainier. Atomic Energy Commissioner Willard F. Libby told the U.S. Senate's Subcommittee on Disarmament in 1958 that the "little fellow"[7] made the mesa jump about six inches, but no radiation escaped. That fact alone, the renowned science writer for *The New York Times*, William L. Laurence, later wrote, "marked a definite turning point in history for both the military and the peacetime uses of atomic energy."[8] He could well write with authority about matters dealing with atomic

energy. Beginning as a science writer with *The Times* in 1930 and later becoming science editor, Laurence won two Pulitzer prizes, including one for his eyewitness account of the bombing of Nagasaki. In addition, for years he wrote about the possibility of an atomic bomb, and then at the height of World War II in 1945, the Army conscripted him to become the official historian of the atomic bomb. That position put him inside the secret laboratories at Los Alamos, New Mexico, and elsewhere, and among the elite scientists constructing the bomb.[9]

The Mount Rainier tests showed, Laurence wrote, that for the first time atomic bombs could be tested underground and that radioactivity could be kept from releasing into the air. By answering the question of fallout from tests that had become the crux of controversy and the trigger for ongoing disarmament talks, the test also opened the door to the peaceful uses of atomic bombs. Indeed, by early 1958 AEC scientists were testifying before a Senate subcommittee about the industrial uses of atomic explosions, including developing oil deposits, building harbors, and creating water supplies and heat reservoirs.[10] In addition, as a result of the successful Mount Rainier blast, the AEC also established Project Plowshare. The project took its name from a biblical allusion to the admonition of the prophet Isaiah about turning "swords into plowshares" made by the physicist I.I. Rabi, who told one of Teller's associates: "So you want to beat your old atomic bombs into plowshares."[11]

Teller said that Plowshare explosions would take place deep underground and that most radioactivity would be trapped below ground. Less than 15 percent would escape as a gas, some of it as dangerous strontium 90. But Teller said he believed that if proper precautions were taken, no one would be exposed to radiation effects greater

than normal background radiation.[12] Besides, he argued, the United States was in a race with the Soviets in developing peaceful uses for atomic weapons. "The Communists might develop Plowshare before we do," he said.[13]

The Media Begin Their Coverage

The New York Times announced the proposed harbor blasts on June 10, 1958 – twice. One three-paragraph brief appeared on Page 18 under the headline "U.S. May Use A-Bombs To Make Alaska Harbor,"[14] and a three-line brief was in its "Washington Proceedings" column two pages later.[15] The longer brief noted that field studies were taking place and then made the economic argument that was so much a part of the AEC's justification of the project. "The commission said the lack of a harbor had hampered development of large-scale mineral deposits in the area. It also said fishing had been 'impeded by the lack of a safe haven.' "[16] However, beginning a tradition that carried through much of its early coverage of Project Chariot, neither of *The Times*'s reports raised the issue of risk to the land and the people of Alaska.

In that same summer, Teller and some of his associates from the AEC and his lab in California began the first of a series of public relations tours of Alaska seeking support from government officials, businesses, and the general populace. On July 14, Teller and his entourage arrived without warning in the Alaska capital of Juneau to formally announce Project Chariot. They then traveled on to Anchorage and Fairbanks to do the same. By all accounts, it was a poorly planned campaign. When the scientists arrived in Juneau, lawmakers were not in session and thus were out of town, as was the governor. Some state Department of Health employees drafted by

Teller's group hastily put together a press conference. During their trek across the state, the group announced plans to blast out the harbor and made their economic argument to justify it.[17]

Six days after Teller and his entourage landed in Juneau, *The New York Times* ran its first explanation about Project Chariot in one paragraph as part of a story about Project Plowshare. Written by William L. Laurence, the story said scientists believed it possible to carve out a 300-foot-deep harbor "by means of four carefully spaced H-bomb blasts."[18] The story then went on for a third of its length to list the economic arguments for Project Plowshare that the AEC had outlined in a report. It spent just one paragraph on the issue of radioactivity and safety, linking that concern to the AEC's discussion of the possible development of a "clean" bomb.[19]

Project Chariot next showed up on August 9, 1958, in *Science News Letter*, but again it was essentially a rehash of the AEC report describing the agency's list of economic benefits to be gained from the peaceful uses of atomic bombs. The only mention of radiation risk noted that researchers were on site in Alaska to determine "whether radiation created would be dangerous."[20]

However, a month later, *Popular Science* published the first full story about Project Chariot, likening the proposed blasts to "waving a magic wand"[21] and instantly creating a harbor. The story said Chariot would "inaugurate an era of grand-scale engineering with atomic weapons."[22] Quoting only the AEC commissioner, Libby, and two Livermore lab scientists, Gerald W. Johnson and Harold Brown, the author largely discounted concerns about the risk of radiation because of continuing advances in clean bombs with reduced fallout and the fact that the Mount Rainier

blast showed an atomic blast could be completely contained underground.[23] What the story did not mention regarding Project Chariot, however, was that to create a hole in which water could fill, the blast could not be contained underground. And it did not seek out other non-governmental sources who might speak to the issue of risk.

In an ongoing information campaign about using nuclear explosions for peaceful purposes, two of the scientific sources in the *Popular Science* article who were also employees of Project Plowshare – Johnson and Brown – turned authors themselves in December 1958 when *Scientific American* published an article of theirs extolling the peaceful uses of nuclear explosions under the Plowshare program. They described the Mount Rainier test blast as a watershed event that made non-military uses of the weapons feasible.[24] Then in May 1959, Johnson's and Brown's boss, Teller, appeared in *The Reader's Digest* to reaffirm the benefits of peaceful nuclear explosions, to list again the many scientific and commercial benefits to be derived from such explosions, to re-iterate the successful Mount Rainier blast's importance, and to call for the world's scientists to work together.

> Now we are nearing success, and the possible benefits to man are so tremendous that they demand a positive new approach to nuclear programs. These must be encouraged, not discouraged. And since people all over the world will benefit from Project Plowshare, I would like to see it placed under international supervision. By working together, scientists from all countries could make Plowshare a decisive victory in man's historic battle to shape the world to his needs.[25]

A month later, *The New York Times* published on its front page its first in-depth story wholly about Project Chariot, noting the balancing act that scientists had to achieve: "The explosions must be just deep enough to produce large craters without throwing radioactive debris sky-high."[26] Quoting both AEC sources and the

University of Alaska president, whose institution was doing much of the research, the story described scientists' ongoing work at the site. But in a dramatic shift from the year before, the AEC told *The Times* that it no longer viewed the proposed harbor as a means of economically developing the remote area. "The planned size of the explosions has been reduced, it [AEC] said, so that the resulting harbor will be small. Possibly this is because of fears that heavy blasts might 'break windows' in the Soviet Union and create a war scare."[27]

But more ominously, with this shift in focus from an instrumental to an experimental project, the region had become an open-air laboratory, and the people who lived, hunted, and fished for subsistence in the region had become essentially laboratory "animals." Quoting John N. Wolfe, chief of the environmental sciences branch of the division of biology and medicine for the AEC, *The Times* story said: "He pointed out yesterday that this would be the first time that it was possible to observe in detail the effect of such explosions on the life of an area."[28] And University of Alaska President Ernest N. Patty continued that theme when he told *The Times,* "In addition to examining the plants and animals of the area, a study will be made of the near-by Kotzebue Eskimos, who depend heavily on the fish and game of the region. This will make it possible, later, to observe the effect of the blasts on their way of life."[29]

Again, this tangential declaration that the Alaska natives were to become a dependent variable in a grand experiment raised no red flags, and *The Times* quoted no outside source unconnected to the project. One could make the accusation that was because the target area was in the remote wilds of Alaska rather than a borough in

New York City. Certainly, however, these early stories about Project Chariot violated a basic journalistic norm set down by Theodore M. Bernstein, *The Times*'s assistant managing editor in charge of copy editors during this period. Writing in his classic textbook on editing, *Headlines and Deadlines,* in editions running from 1933 through the 1960s, Bernstein instructed: "In respect to fairness, the copy editor should keep watch to be sure that every party to a controversy gets a hearing. . . . If no effort to obtain both sides of the story has been made, the copy editor should call the attention of the editor in charge to the failure to do so."[30] It is unknown, however, whether the editor in charge was alerted to the one-sided nature of the Project Chariot stories.

Of course, the Project Chariot story began in 1958, and it had only been during the 1950s under the tutelage of Managing Editor Turner Catledge that *The Times* – with the threat of competition from television news – began to rethink how it did the news. As Gay Talese pointed out in his history of *The Times, The Kingdom and the Power,* the paper, because of its size, traditions, and many personalities, was like a huge ship. It took time to turn it around.[31] In addition, any such rethinking would naturally confront the credo of *The Times* patriarch, Adolph Ochs, which still lived in the newsroom: "To Give the News Impartially, Without Fear of Favor."[32] However, Catledge "was confident that newspapers could bring readers more details and could explain the significance of these details more effectively than could television," Talese noted.[33]

> Newspaper reporters would now have to dig more deeply into more areas and to inform the public more thoroughly; they could no longer merely report all the facts, but they would often have to interpret the meaning behind these facts. The trick was to do this without editorializing. While there was a difference between interpreting and editorializing, Catledge knew that the line between the two was sometimes thin, and if the *The Times* was to achieve the

> new goal and yet avoid making a mockery of Ochs's motto about objectivity, it had to have a more vigilant copydesk.[34]

It was six months later that a *Times* story for the first time quoted a project official, Gerald W. Johnson, saying the explosions would send up a cloud of dust 15,000 to 20,000 feet, which would then fall to earth within a 180-mile radius.[35] In addition, he told *Newsweek* in February 1960 that 99 percent of the radioactivity would remain underground and that only 1 percent would return as fallout. "Whatever radiation risks are involved in such nuclear sculpturing, Johnson believes the economic advantages will outweigh them."[36]

But "risk" was the fulcrum upon which the proposed harbor blast project's continuing survival rested, and as it progressed, several forces began to come together to investigate and publicize its risk. Early on, University of Alaska scientists participating in the research connected to the project called for the AEC to commit to environmental studies of the potential impact on the area around Ogotoruk Creek. Teller and his associate director at the Lawrence Radiation Laboratory, Gerald Johnson, offered to fund such studies, though that latter apparently wanted to avoid the use of the term "environmental" and instead preferred "health and safety."[37] This was long before the environmental movement persuaded the federal government to require an environmental impact statement (EIS) for such projects. In fact, Dan O'Neill, who has written about the history of Project Chariot, pointed out in an interview that "the first truly coordinated, multidisciplinary bioenvironmental study ever done took place then up at Ogotoruk Creek, south of Point Hope, and from that

study came information that ultimately started to suggest the project wasn't too smart."[38]

Meanwhile, for the first time, a story in the March 13 *Times* raised the issue of the blasts' possible adverse effects on the Alaska natives and on their hunting grounds and noted that there was too much research still to be done on the experiment's safety to set off the explosions any time soon. The story quoted an AEC environmental committee's report that the blasts must not damage any food source and must not deliver any radiation in excess of that "specified as acceptable for the general public."[39] But what that enjoinder failed to take into account was previous research into the effects of fallout from above-ground tests which showed that Eskimos who ate caribou appeared to already have the highest levels of strontium 90 of any group in the world.[40]

In that same month, Teller was busy at his typewriter again, this time with a story in *Popular Mechanics* about how Project Plowshare was going to "work miracles."[41] While he finally explored in depth the risks of radiation, he raised more questions than he answered. For example: "The remote site was chosen deliberately to allay any fears of radioactive contamination."[42] That posed the question: What about the risk to the residents of the region (the nearly 400 Inupiat Eskimos thirty-one miles to the north and the Kotzebue Eskimos 100 miles to the south)? Recall that earlier AEC officials had said that the fallout would spread in a radius of 180 miles.

Teller also noted that because of the way the explosive devices would be buried, all but 10 to 20 percent of the radioactivity would be trapped below the surface: "It is possible that we shall succeed even better and that all but a very small

percentage of the radioactivity will be safely contained underground."[43] There was a lot less certainty in that statement than what Johnson told *Newsweek* in February 1960: 99 percent of the radioactivity would remain underground. Had the risk increased since then?

And like the University of Alaska president had done earlier, Teller also seemed to be saying that the Alaska natives were lab "animals" in a grand experiment – they were the dependent variable upon which researchers would determine if the independent variable, radioactivity, had an effect.

> They [researchers] are studying the geology and making biological surveys of the plant and animal life. They are investigating the food "chains" and the habits of the few local Eskimos, their food sources and their hunting and fishing areas.
>
> Similar surveys will be made at some future date after the creation of the harbor. Thus we will learn whether any local conditions were changed by the blasts. This is indicative of the care and caution with which we are approaching this first large demonstration.[44]

About five months after that article, the AEC issued a report pronouncing the proposed blasts safe from a biological standpoint. *The New York Times* ran a story in which AEC officials said the blasts would send 30 million cubic yards of material 30,000 feet into the air.[45] There was no mention of radiation or the subsequent fallout. A follow to that story came four months later when *The Times* described the ongoing research that was taking place in the region with scientists observing such things as marine life, birds, plants, and even Eskimos as they went hunting. Again, AEC officials were quoted as saying the blasts would cause no undue harm. According to John N. Wolfe, the head of the group of scientists conducting the survey: "We know now that the excavation won't affect the health, food sources, and general livelihood

of the natives."[46] Again, conforming to earlier stories in the paper, there was no source quoted who was not connected to the project.

Meanwhile, though, a fledgling environmental group, the Alaska Conservation Society, with 200 dues-paying members, was trying to show the world the risk to the land and its people and to make its small voice heard. In conjunction with two University of Alaska professors involved in the research at the proposed site of the nuclear harbor and an Arctic geographer, Don Foote, who the AEC had hired to conduct studies of the Cape Thompson area, the society essentially changed the course of history. It altered media coverage of Project Chariot by working in a grass-roots effort with scientific experts who could give validity to the society's concerns. In the spring of 1961, the three scientists broke away from the AEC's standing line that the blasts would do no harm. They outlined their research regarding Project Chariot's potential effects on the area around Cape Thompson and published it in the Alaska Conservation Society's *News Bulletin*.[47]

One report identified the connection between radiation, the lichen that caribou ate, and the Eskimos who ate the caribou. The scientists noted that the tundra's food chain was especially sensitive to radioactive fallout from the recent above-ground atomic bomb tests over Nevada and in the Soviet Union. The caribou's main food source is lichen, which, unlike grass that cows in the lower forty-eight states subsist on, is a rootless plant that receives its sustenance from the dust that falls on it through rain and snow, thus directly absorbing radioactivity before it is washed off. Therefore, research had shown that caribou in Alaska contained about seven times as much strontium 90 as domestic cattle in the lower forty-eight states. And

because caribou were a large part of the Eskimos' diet, they had much more of the dangerous isotope in their bodies than people anywhere else in the world. How much more of the isotope would the proposed nuclear detonations add to their bodies, the Eskimos asked?[48]

"Produced in advance of the AEC summary report – which the biologists expected would have a prodevelopment slant – the Alaska Conservation Society *News Bulletin* was essentially a 'minority report' emphasizing environmental considerations,"[49] O'Neill noted in his history of Project Chariot. With that report linking radiation to lichen, caribou, and the native population in its newsletter, the Alaska Conservation Society then mimeographed 1,000 copies of the *News Bulletin* and sent them to conservationists across the United States and government officials in Washington, D.C.[50]

More significantly, the three scientists sent copies of their contributions to the *News Bulletin* to Barry Commoner, a plant physiologist at Washington University in St. Louis who founded a group known as the Committee for Nuclear Information (CNI) in 1958.[51] It was his attempt to discover more about the links between radiation, lichen, caribou, and Eskimos that Commoner – soon to become one of the leaders of the modern environmental movement – described as his "introduction to ecology." "It was when I realized that the different ecosystem in Alaska deeply conditioned the outcome of this technological impact, that I realized that what we were doing in our work on radiation was really an aspect of what is now called environmentalism," Commoner said in an interview with author Dan O'Neill in a 1994 history of Project Chariot.[52]

In fact in an earlier interview in 1988, Commoner said the beginnings of the modern environmental movement can be found in the controversy and debate surrounding Project Chariot:

> Looking back on my career in environmentalism, it is absolutely certain that it began when I went to the library to look up lichen in connection with the Chariot program. That's a very vivid picture in my mind. And I think, in so far as I had an effect on the development of the whole movement (which I did, I have to admit), Project Chariot can be regarded as the ancestral birthplace of at least a large segment of the environmental movement.[53]

Commoner had been looking for more information about Project Chariot after publishing two issues of his CNI newsletter in the summer of 1960 about the project. The newsletter editor had written to the Chariot researchers: "The two issues 'stimulated such an unprecedented volume of responses from scientists and non-scientists here and abroad, and from government agencies that we feel impelled to publish additional material.' "[54]

In June 1961, CNI's Chariot issue described the lichen-to-Eskimo link and criticized the reliability of AEC estimates about the amount of nuclear fallout that the Project Chariot blasts would generate. Almost immediately, *The New York Times* published a story on the report and the threat to Project Chariot. It was the first time that it had written about the subject using sources that had anything negative to say about the project. The first four paragraphs of the story were a damning indictment of the science surrounding the project.

> Because lichens thrive on fall-out and caribou eat lichens and Eskimos eat caribou, the Atomic Energy Commission may encounter unexpected difficulties in its plans to use atomic explosives to carve out a harbor in northern Alaska.

> In the process of blasting out the harbor, the commission might contaminate the food chain in the Arctic region so that radioactive strontium 90 would pass from plants into animals and thence into the bones of Eskimos.
>
> This note of caution about the Alaska harbor project was sounded today by the Committee for Nuclear Information, a St. Louis organization of scientists and laymen founded in 1958 to promote public understanding and knowledge of nuclear problems.
>
> The report, much of it based on previously unpublished studies made for the commission by University of Alaska biologists, constitutes the first comprehensive public analysis of the probable gains and risks of one of the commission's key projects for developing the peaceful uses of atomic explosives.[55]

Eight days later, *The Times* followed with an editorial about safety and atomic energy. Citing project opponents' concern with the lichen-to-Eskimo link, the editorial writer cautioned: "The commission must answer these opponents fully and satisfactorily if public opinion is to support the project."[56]

The commission's response came within days when it issued its "First Summary Report" on Project Chariot. Prepared by the Committee on Environmental Studies for Project Chariot, the report denied the likelihood of a fallout hazard from the blasts and ignored any discussion of fallout connections to lichen and caribou. With the two sides firmly fixed in a face-off, *The New York Times* framed its story about the AEC's report in the form of a debate over risk. "The report placed the commission in general opposition to a committee of scientists and laymen in St. Louis known as the Committee for Nuclear Information. Last Saturday, the St. Louis group issued its own study of the safety of the Alaska project and came to the conclusion there might be hidden dangers of radioactive contamination of the food chain in Alaska."[57]

With these new elements of risk and debate, magazines also quickly picked up on the story. The June 17 issue of *Science News Letter* essentially ran CNI's description of the lichen-to-Eskimo link and its criticism of AEC estimates of total fallout. It then followed that short article with another that essentially gave the AEC's side of the issue, which said it saw no reason to stop Project Chariot.[58]

With both the AEC and CNI reports circulating and being debated, the magazine *Science* ran a review of the two conflicting reports under the headline: "Project Chariot: Two Groups of Scientists Issue 'Objective' But Conflicting Reports." The writer, Howard Margolis, faulted the AEC report for some omissions, but then he targeted the CNI report, especially questioning its estimates of how much strontium 90 the Project Chariot blasts would release. He also described CNI as a citizens group interested in radiation education, failing to note that it also was made up of scientists.[59]

O'Neill, in his book about Project Chariot, noted that the evidence indicated that in preparing his article, Margolis relied on the AEC's point of view and Commoner believed he had been briefed by the AEC on the CNI report before he even saw it. "Several of Margolis's criticisms form the core of AEC comments prepared for use within that agency," O'Neill said.[60] Two months later, Commoner responded with a rebuttal in the same magazine and criticized Margolis.[61]

Meanwhile, two of the scientists involved in the reports that became national news were busy putting together information that would eventually help make Project Chariot a footnote in history. In late 1961, William Pruitt and Don Foote had heard that the national magazine *Harper's* had commissioned conservation writer Paul

Brooks to research and write an article on Project Chariot. He was editor in chief at Houghton Mifflin and had written a number of essays based on personal experiences in the wilderness. Both men believed Brooks would do a good job, especially if he received help with gathering information. Foote quickly contacted his brother Joseph Foote, a Harvard Law graduate and a member of the Massachusetts bar. Joseph Foote soon connected with Brooks, supplied him with information gathered by his brother, and became a co-author on the article "The Disturbing Story of Project Chariot," which appeared in the April 1962 *Harper's* magazine.[62]

The article began by questioning why so little had been publicized about the project and then outlined its history and unveiled the changing nature of policy surrounding it since its inception in 1958. First it was to build a self-supporting harbor that Alaskans could use to develop the interior of the state. Then, apparently, it became an experiment to determine the efficacy of nuclear excavation. Which was it, they asked?[63]

Ultimately, the authors answered that question, and for the first time raised the issue of the AEC's apparent policy of using the region's people as lab "animals" in their grand experiment, an issue alluded to but never explicitly explored in earlier media reports. Citing the delicate link between radiation, lichens, caribou, and Eskimos, the authors concluded: "Project Chariot is quite frankly an experiment; and the essence of experiment is uncertainty. Let's phrase the question differently. What sort of risk are we talking about? And does that delicate balance of life at Cape Thompson, which in turn is so closely tied in with the life of the Eskimos, allow any margin for uncertainty?"[64]

But besides questioning the AEC's use of Eskimos as lab "animals," Brooks and Foote in their last paragraph ended with an equally disturbing implication: the threat that an agency of the government held unaccountable to the public can have on democracy.

> "If your mountain is not in the right place," said Dr. Teller at Anchorage, "just drop us a card." It was only half a joke. Our ability to alter the earth we live on is already appalling. Few of us are in a position to judge the ultimate scientific value of an experiment like the Chariot explosion. But it *is* up to us to know what is going on in that far corner of the United States. And to realize that another scale of values is also involved: not the precise relations between depth of burst and crater characteristics, but the precise relations between unlimited power and the awesome responsibility that goes with its use.[65]

Those words echoed the sentiments of Commoner, who in a 1997 interview with the magazine *Scientific American*, said: "The AEC taught us that when science is forced to serve a powerful self-justified purpose, it becomes too narrow to serve the wider needs of society. It was the independent scientists, outside the AEC, who understood their obligation to society."[66]

While it certainly cannot be said that the *Harper's* article killed the project, *The New York Times* within weeks carried a story that Chariot was being put on hold because it was losing the battle for public opinion. *The Times's* Lawrence E. Davies wrote: "Project Chariot may well be dead, killed by adverse publicity about its effects on Alaskan Eskimos and their hunting grounds."[67] Quoting mostly unnamed sources at the AEC, Davies wrote that the agency's Project Chariot environmental committee appeared to be leaning toward neither recommending for or against the blasts at a meeting scheduled for early the next month. While the story was equivocal about the

project's future, it did quote one unidentified scientist, who said: "I have very grave doubts that they will ever make that shot."[68]

Those doubts proved true. On August 25, 1962, *The New York Times* announced Project Chariot's demise. Ironically, in the same way it published the news of the project's inception in 1958, *The Times's* announcement appeared twice on the same day. The first was in a short Associated Press brief that said the harbor blasting project had been "put off by the Atomic Energy Commission."[69] The second item in a summary roundup of Washington news was much shorter, but much more definitive: "The Atomic Energy Commission announced it had given up a plan to use nuclear explosives to create a harbor on the coast of Alaska."[70] Many years later, Teller told the national radio program *Living on Earth* that he still supported the idea behind Project Plowshare. "Chariot was cancelled because of exaggerated fear of radioactivity. That was a mistake," he said.[71]

Conclusion

It may approach a cliché to say the media are a watchdog, which, through airing all the facts they can find surrounding a story, unfurling its many dimensions, and prompting a public debate, hold government and other powers accountable for their actions. Still, it is a truism that is at the heart of democracy. And to that point, this study of the print media's response to Project Chariot indicates the dangers that can occur when the media are missing in action. Certainly, *The New York Times* wrote extensively about the project, but for the most part its stories as well as those from the magazines discussed – especially early on – approached a form of passive

stenography and not the active, probing type of journalism that seeks out other sources and questions the party line. The stories essentially repeated officialdom's point of view and until much later failed to seek out critics of the proposed harbor blasting. Finally, it was those critics that used the media and held the media accountable in relation to the story about Project Chariot. Those critics, the scientists who disagreed with the AEC conclusions regarding risk, the fledgling Alaska Conservation Society, and Barry Commoner and his Committee for Nuclear Information, put together a grass-roots pipeline to national media exposure that overcame journalistic apathy and the powerful voice of government. It was a way of making their voices heard that became a template for the modern environmental movement's media strategies involving information and symbolic politics that is still being used today.[72]

Notes

[1] Edward Teller with Allen Brown, *The Legacy of Hiroshima* (Garden City, N.Y.: Doubleday, 1962), 84.

[2] Norman Chance, *Project Chariot: The Legacy of Cape Thompson, Alaska* (available at http://borealis.lib.uconn.edu/ArcticCircle/virtualclassroom/chariot/chariot.html) accessed February 8, 2003.

[3] Dan O'Neill, *The Firecracker Boys* (New York: St. Martin's Press, 1994), 29-30.

[4] Lawrence E. Davies, "A-Blast to Dig Alaska Harbor May Be Deferred," *The New York Times*, May 13, 1962.

[5] Chance, *Project Chariot.*

[6] Teller, *The Legacy of Hiroshima*, 84. The atomic bombs exploded over Hiroshima and Nagasaki in World War II were each twenty kilotons.

[7] "Peaceful Atomic Blasting," *Time*, March 24, 1958, 64.

[8] William L. Laurence, *Men and Atoms: The Discovery, the Uses and the Future of Atomic Energy* (New York: Simon and Schuster, 1959), 255.

[9] Ibid., 96.

[10] Ibid.

[11] Teller, *The Legacy of Hiroshima,* 82.

[12] Ibid.

[13] Ibid., 87.

[14] "U.S. May Use A-Bombs To Make Alaska Harbor," *The New York Times*, June 10, 1958.

[15] "Washington Proceedings," *The New York Times*, June 10, 1958.

[16] "U.S. May Use A-Bombs To Make Alaska Harbor."

[17] Chance, *Project Chariot.*

[18] William L. Laurence, "Project Plowshare Studies Ways of Using Immense Force of H-Bombs Peaceably," *The New York Times,* July 20, 1958. Three months later, the magazine *Science Digest* (October 1958) published a condensed version of this story under the title "Peaceful Uses For the H-Bomb."

[19] Ibid.

[20] "Plan Excavation by Bomb," *Science News Letter,* August 9, 1958, 83.

[21] Alden P. Armagnac, "Atomic Blasting for Peacetime Feats," *Popular Science,* September 1958, 102.

[22] Ibid., 102.

[23] Ibid., 103.

[24] Gerald W. Johnson and Harold Brown, "Non-Military Uses of Nuclear Explosives," *Scientific American*, December 1958, 29-35.

[25] Edward Teller as told to Allen Brown, "How Nuclear Blasts Can be Used for Peace," *The Reader's Digest,* May 1959, 108.

[26] Walter Sullivan, "H-Bombs May Dig Harbor in Alaska," *The New York Times,* June 5, 1959.

[27] Ibid.

[28] Ibid.

[29] Ibid.

[30] Robert E. Garst and Theodore Manline Bernstein, *Headlines and Deadlines: A Manual for Copyeditors,* 2nd ed., New York: Columbia University Press, 1940.

[31] Gay Talese, *The Kingdom and the Power* (Garden City, New York: Anchor Books, 1978), 222. Originally published in hardback by New American Library, Inc., in association with World Publishing Company, 1969.

[32] Ibid., 6.

[33] Ibid., 222.

[34] Ibid.

[35] Walter Sullivan, "3 Underground A-Blasts Slated," *The New York Times,* January 28, 1960.

[36] "Dr. Johnson's Magic," *Newsweek,* February 8, 1960, 67.

[37] O'Neill, *The Firecracker Boys*, 77.

[38] *Living on Earth,* October 9, 1992, radio script (available at http://www.loe.org/archives/921009.htm) accessed on September 16, 2002.

[39] "A.E.C. Is Pursuing Harbor Project," *The New York Times,* March 13, 1960.

[40] O'Neill, *The Firecracker Boys*, 209.

[41] Edward Teller, "We're Going to Work Miracles," *Popular Mechanics,* March 1960, 97.

[42] Ibid., 99.

[43] Ibid.

[44] Ibid., 100.

[45] Lawrence E. Davies, "Proposed Atomic Blast in Arctic is Called Safe," *The New York Times,* August 17, 1960.

[46] "Alaska Area Eyes All Forms of Life," *The New York Times,* December 4, 1960.

[47] O'Neill, *The Firecracker Boys*, 186.

[48] Chance, *Project Chariot.*

[49] O'Neill, *The Firecracker Boys*, 187.

[50] Ibid., 187.

[51] Ibid., 209.

[52] Ibid., 210. In fact, others have noted Commoner's role as one of the founders of the modern environmental movement. For example, Bibi Booth, in *Environmental Activists,* eds. John Mongillo and Bibi Booth, Westport, Connecticut: Greenwood Press, 2001, says: "Many people believe that Commoner's ideas helped prepare the world for the grassroots environmentalism and citizen activism that emerged in the 1960s and 1970s, and he is credited with being one of the founders and leaders of the modern environmental movement."

[53] Tape-recorded oral history interview with Dan O'Neill, 289. Available at the University of Alaska Fairbanks Archives. Quoted in O'Neill, *The Firecracker Boys*, 268-69.

[54] O'Neill, *The Firecracker Boys*, 208.

[55] "Caribou May Bar Alaska A-Blasts," *The New York Times,* June 4, 1961.

[56] "Safety and the Atom," *The New York Times,* June 12, 1961.

[57] "A.E.C. Backs Plan for Alaska Blast," *The New York Times,* June 19,1961.

[58] "High Alaska Fallout Risk," and "AEC Finds No Reason to Stop "Chariot," *Science News Letter,* June 17, 1961, 375.

[59] Howard Margolis, "Project Chariot: Two Groups of Scientists Issue 'Objective' But Conflicting Reports," *Science*, June 23, 1961, 2000-2001.

[60] O'Neill, *The Firecracker Boys*, 214.

[61] Barry Commoner, M.W. Friedlander, and Eric Reiss, "Project Chariot," *Science*, August 18, 1961, 495-500.

[62] O'Neill, *The Firecracker Boys*, 241.

[63] Paul Brooks and Joseph Foote, "The Disturbing Story of Project Chariot," *Harpers,* April 1962, 60-61.

[64] Ibid., 66.

[65] Ibid., 67.

[66] Alan Hall, "Interview with Barry Commoner," *Scientific American,* June 23, 1997 (available at http://www.sciam.../print_version.cfm?articleID=000339231-7DID-1CDA-B4A8809EC588EED) accessed on March 3, 2003.

[67] Lawrence E. Davies, "A-Blast to Dig Alaska Harbor May Be Deferred," *The New York Times,* May 7, 1962.

[68] Ibid.

[69] "Harbor-Blasting Project In Alaska Put Off by U.S.," *The New York Times,* August 25, 1962.

[70] "The Proceedings In Washington," *The New York Times,* August 25, 1962.

[71] *Living on Earth.*

[72] Information politics and symbolic politics involve a grass-roots effort to frame a story by putting a face upon the potential victims of some plan, proposal or policy and then activists supporting the case they are trying to make through the validation of scientific research. In the case of Project Chariot, that involved the Eskimos who lived near the site of the proposed harbor blasts and the effect that scientists said radiation could have on them through the food chain from lichen to caribou to humans. The same environmental strategy can be seen in the long-running battle in the West to tear down many of the dams on the region's rivers. Here, the victim has been presented as the wild runs of salmon slowly diminishing toward extinction because of the many barriers between them and their eons-old spawning beds. More recently, the same use of information and symbolic politics as a strategy of the environmental movement involved the defeat of a plan to drill for oil in the Arctic National Wildlife Refuge. Again, the successful confrontation with government and powerful oil industry interests involved a grassroots effort beginning with putting at the center of the debate the region's Gwich'in Indians and their dependence on the caribou that oil drilling could harm. "It's effective because so much of Congress is about listening to the local impacts, who will be affected. It's all the more poignant when you are talking about indigenous people," the Sierra Club's Melinda Pierce said in a June 29, 2002, *Boston Globe* story, "Two Tribes Split on Alaska Oil Plan."

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